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The Journal of Applied Psychology

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LEARNING AND STABILITY[1]

A Psychophysiological Analysis of a Case of Motor Learning with Clinical Applications

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I

The belief that motor coördinations may have a discoverable psychophysiology and the hope that a detailed analysis of one of the simplest coördinations it is possible to keep under conditions of adequate scientific control may throw some light on the problem and be of service in the clinical field have led to this investigation. It is evident to all workers in the quantitative aspects of motor learning that few serious attempts have been made to study the physiological side of the establishment of motor coördinations. As evidence of this fact one may note that one of the most popular theories of the process of motor learning assumes that the coördination rests essentially upon the survival of good accidents. The fact that the loss of coördinations in an abnormal subject is today generally accepted as another accident is to be expected. The application to the clinical field may be, in the end, the best test of the validity of our analyses of the mechanics of learning.

An earlier study of the author's (Psycho. Rev. Mono. Sup. No. 124) dealt mainly with the introspective and qualitative aspects of a case of trial and error learning in the human subject.

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[1] This study was carried out in the laboratory and psychological clinic of the University of Utah. The writer is very greatly indebted to President George Thomas, of the University of Utah, who has encouraged this research through special grant of time and funds, and to his advanced students who have aided the writer in collecting the data through individual examinations over a period of six years.

The present study will deal with the quantitative and clinical aspects of this same problem.

II. THE STABILIMETER

Our analysis has involved the development of a highly specialized form of mirror tracing. To get essential experimental controls we have had to perfect a mirror tracing device which we call the *stabilimeter*. In our experience no form of mirror tracing, as usually studied in laboratory classes, is at all capable of furnishing the experimental controls necessary for a serviceable analysis of this coördination. The *stabilimeter* consists of a tracing instrument involving a path to be traced, a mirror producing a good image, a soft copper stylus to be used pencil-fashion for tracing the path, and an apparatus for counting the electric impulses. The tracing instrument involves a sheet of brass, from which has been cut a star-shaped

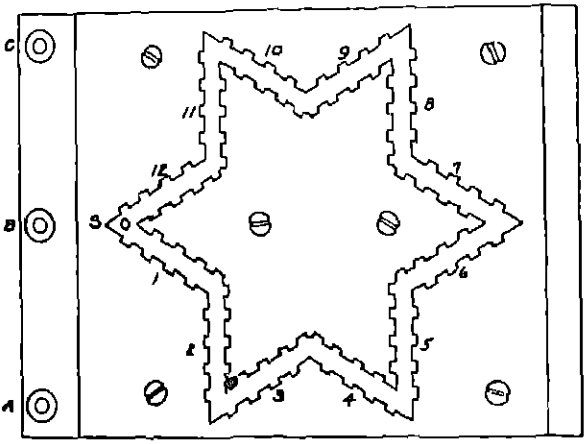

FIG. 1. DRAWING OF THE TRACING INSTRUMENT, WHICH CONSISTS OF A STAR-SHAPED PATH CUT FROM A SHEET OF BRASS

The brass plates are screwed to a heavy glass plate. The starting point is S and the sides of the paths are traversed in the order indicated. *A*, *B*, and *C* are binding posts. This instrument is obscured from direct vision by a screen.

path one-fourth inch in width. The brass sheet is mounted upon a heavy glass plate. Niches are cut in the sides of the path to prevent sliding of the stylus along the edge of the path[1] (see fig. 1). The glass plate forming the bottom of the path is kept clean and without scratches. Electrical connections are made between the brass plate, the stylus and the electric counter. For the latter we have used the Stoelting electric counter, and at times the Western Electric *P.B.X.* message register. Contacts made between the stylus and the brass plate are recorded by the counting mechanism. Time is kept with a stop watch. The one-hundred second type has been found the most serviceable.

As indicated above, our subjects follow the path of the star-shaped design by means of the mirror image, the direct vision of hand and tracing instrument being obstructed by a screen so placed as to give unobstructed mirror vision of the hand and tracing instrument but to obstruct the direct vision.

III. CONTROL THROUGH INSTRUCTIONS

Our first experimental difficulty is concerned with the control of the subject's attitude. One subject who is told to "trace around the path as rapidly as possible and make as few errors as possible" will concentrate his attention upon the avoidance of errors; while another subject, with the same instructions, may devote more of his attention to the securing of speed. The results in the two cases are often not comparable. Early in our work we found that attempts to juggle the two scores, time in seconds and contacts or errors, by methods involving mathematical devices, were doomed to failure unless these methods involved the true mathematical relation of the time and error quantities themselves. This relationship was found as follows.

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[1] The effect of these niches is merely to force the subject out in the path and to quickly acquire the coordination. All of the findings in this study have been verified by checking against data secured from instruments with smooth edges. The data in the two cases are entirely comparable provided the experimenter sees to it that the beginner does not slide his stylus along the edge of the path when the straight edges are used. The niches force the subject to adopt the learning attitude at once.

We had observed that with the experienced subjects an increase in speed produced an increase in the number of errors or contacts. Also, we found that if a number of highly experienced subjects be selected and kept under the instructions to "move around as fast as possible and avoid making contacts as far as possible," the average error scores and the average time scores will approach equality; that is, the time in seconds will equal the number of contacts. This gave us our pacing principle: *the time in seconds and the number of errors are kept approximately equal.* This device works splendidly. The instructions are given as above and then the experimenter controls the subject so that the time in seconds and the error count are kept equal. A subject moving too rapidly for his highest efficiency will be recording too many errors in comparison with the time he is taking, and is told to move more slowly and more carefully. If the subject has a time score greater than the error score he is told to move more rapidly. The pacing is done during the act of tracing and involves no interference or annoyance to the subject.

IV. THE MEANING OF OUR SCORES

In addition to the securing of a constant attitude from the subject at all times and one that will be the same from one subject to another, there is the question as to the meaning of the time and error scores. This problem lies so near to that of pacing that it will be discussed at this time. To avoid complications arising from the learning process, we shall at present consider only highly experienced subjects who, for practical purposes, may be regarded as having reached the limit of their improvement. When such subjects are carried through a practice involving a pacing for equality of time and error scores, and are then *gradually* changed over to emphasis upon avoidance of errors, it is found that the errors can be completely eliminated and the sum of the time and error quantities will remain a constant throughout the practice; in other words, the score (sum of time and errors) may be reduced entirely to *time* (see table 1). The reverse process, of reducing the time taken while the errors are allowed to increase, produces no constant at all but a gradually increasing total (time plus errors) score. By methods to be presented later, which have the effect of inhibiting the learning, it can be shown that this constant relation holds—there being, of course, a change of constants as learning proceeds—for all levels of the learning curve where subjects can be paced, which includes all but the first three or four circuits in the practice of subjects of low efficiency. It holds for subjects of high or average efficiency at all points of the learning curve. However, this constant relation does not hold when the subject is not paced. As an illustration, if the subject adapted to equality of time and error scores be asked to move very slowly and avoid

TABLE 1

*Relation between time and error quantities among subjects who have practically reached the limit of improvement and for whom the learning factor is neglible**

SUBJECT	GOING SLOWER					GOING FASTER		
	T = E	T = 2E	T = 3E	T = 4E	E = 0	T = ½E	T = ⅓E	T = ¼E
1	21.7	23.0	21.7	21.7	21.6	23.4	28.7	30.1
2	20.6	20.4	19.9	20.0	20.4	25.3	31.7	39.7
3	20.5	19.1	21.2	20.5	21.0	26.6	33.0	39.3
4	20.3	20.7	20.4	20.2	20.0	22.7	40.0	00.0
5	25.4	25.2	24.9	25.0	25.2	30.1	35.0	49.7
6	22.8	23.3	22.0	22.4	22.0	25.0	28.6	32.8
Average......	21.9	21.0	21.7	21.7	21.7	25.5	32.8	41.0

* In this table each score is the sum of the time in seconds and the number of errors. In the second column is shown the sum of the time and error quantities when subjects are paced for equality of time and errors. *In the third column the scores represent the sum of the two* quantities when the subject is asked to go more slowly, so that the error count is one-half the time score. In all cases the experimenter only, not the subject, is aware of the time and error relations. Instructions are given only during the act of tracing and consist solely of "go more slowly" or "go faster." Scores are averages of five circuits in series.

errors, he will take more time than is needed as shown by the sum of the time and error scores. The subject must be worked over very gradually since any sudden emphasis upon avoiding errors is certain to involve a time factor too large for the constant sum.

Now what is the meaning of this peculiar constancy? The answer seems to rest upon the fact that we are measuring the *capacity* of a sensori-motor pattern to *endure stimulation.* The subject is moving his stylus down the middle of a narrow path. If he moves slowly he makes few errors, if he moves rapidly he makes many. In the practice involving equality of time and error scores he was asked to move at such a speed that he made one error for each second of time taken. By reference to table 1 it can be seen that this will involve the highest speed for which the constant relation holds. The time taken to make the circuit under such conditions becomes a reciprocal measure of the endurance capacity of the pattern.

Let us consider a subject who, say, makes the circuit in twenty seconds with twenty errors. This subject, at the same level of learning, will make the circuit with no errors in forty seconds; which means that if forty seconds are taken the coördination pattern is not broken; an error is a break in the coördination. It is clear that the path of the instrument is made up of stimulation points which stimulate this eye-hand coördination. In our example, the reciprocal of forty will then become a measure of the endurance capacity of the pattern to meet these stimulations. Or, to put it another way, if there were one thousand stimulation points in the path, then $\frac{1000}{40}$ or *25* would represent the number of stimulations per second the pattern could just endure without breaking.

From the above it can be seen that any *paced* score can be reduced to an endurance capacity score. In practice, we use only results secured from experiments where equality of time and errors is maintained. This is due entirely to the extreme ease of pacing the subject under such conditions. It will be seen that our proof in table 1 involves only the relation between the time and error quantities when the learning factor is eliminated, but the relation holds, with change of constants, for all levels of the learning curve where subjects can be paced. Under such conditions, the score found from the sum of the time and error quantities becomes a reciprocal measure of the capacity of a growing pattern to endure stimulation, and the learning curve merely marks successive stages of growth in this capacity.

TABLE 2

*Improvement as a function of the length of time interval between circuits**

CIRCUIT	110 SUBJECTS (SERIES PRACTICE)			100 SUBJECTS (ONE-MINUTE RECESS)			80 SUBJECTS (ONE-DAY RECESS)		
	Q_1	Q_2	Q_3	Q_1	Q_2	Q_3	Q_1	Q_2	Q_3
1	3.1	5.0	7.5	3.1	5.0	7.4	2.7	5.0	7.7
2	4.6	0.1	10.0	5.4	8.7	11.9	8.3	11.4	14.3
3	5.6	7.7	10.7	7.7	10.4	13.9	11.4	14.4	17.5
4	6.7	8.5	11.9	10.3	12.7	16.8	13.3	15.9	19.3
5	7.3	10.0	12.6	10.6	14.3	17.0	16.0	18.0	20.7
6	8.5	10.5	13.5	12.3	16.1	19.4	18.0	20.0	24.0
7	9.2	11.2	14.0	13.6	17.1	20.4	18.0	20.6	24.0
8	10.0	12.3	15.3	14.5	17.2	20.3	18.6	21.8	25.3
9	9.9	11.0	15.4	15.1	18.2	22.2	20.0	22.1	25.7
10	10.7	13.1	10.0	15.5	18.9	22.8	19.7	22.0	27.1
11	10.4	13.7	17.2	16.7	20.0	23.8	20.4	23.1	20.2
12	11.6	13.7	17.0	17.7	20.8	24.3	20.8	23.9	27.4
13	12.8	14.9	18.0	18.2	20.8	26.0	20.6	24.5	27.4
14	13.0	15.4	17.2	18.5	22.0	25.8	21.3	24.8	27.7
15	13.3	15.2	18.2	18.7	22.4	20.3	21.9	25.4	27.9
16	13.3	15.4	17.9	18.5	21.4	25.7	22.8	25.7	30.2
17	13.2	16.1	18.9	19.5	23.0	26.4	22.3	25.5	20.0
18	14.3	15.9	18.9	20.3	23.8	27.7	23.1	27.6	32.5
19	13.7	16.7	10.2	20.2	24.2	28.2	23.2	27.0	30.6
20	14.5	16.7	20.0	19.7	22.0	26.3	23.0	26.7	30.4

* The scores in this table are C scores, i.e., $\frac{1000}{T+E}$, and are taken from paced practice. All conditions are identical in the three practices except the length of time interval. All subjects are inexperienced. The median scores are plotted in figure 2.

These endurance capacity scores we have called C scores, since they measure *capacity* to *conduct*. The formula is C

score = $\frac{1000}{T + E}$, where T and E refer to time and errors. (In practice the reciprocal is thus multiplied by one thousand to avoid awkward decimals). The scores found by simply adding the time and error quantities we have called R scores, *raw* or *resistance* scores, since they measure, not conduction, but resistance to conduction. Thus R score $= T + E$, and C score $= \frac{1000}{R}$. The learning curve made up of R scores would be a decreasing function and would mark successive stages in the decrease of resistance to conduction.

V. THE LEARNING CURVE UNDER DIFFERENT CONDITIONS OF PRACTICE

Contrary to the widely accepted view that learning is simply a matter of so much practice, or is largely a function of repetitions alone—most laboratories conduct learning experiments as though this were true—our findings, from the outset, point to the fact that the conditions of practice are most important (see fig. 2). Thus, under pacing conditions which secure a constant attitude of the subject, the learning curve will depend upon whether repetitions or circuits of the instrument follow each other in continuous series, that is, without a time interval between successive circuits (our term here is *series practice*), or are separated by time intervals.

In case time intervals separate the circuits, the improvement in the earlier part of the practice will be a positive function of the length of the time interval. The rate of improvement is a function of the length of the time interval only during the early part of the practice, when the coördination pattern is being built. Beyond this early adaptation stage the improvement is a function of the number of repetitions. For convenience of description we have called the early stage of the curve, where the improvement depends upon more than repetition alone, the *adaptation* stage, and the remainder of the curve where improvement is a function of repetition alone, the *facilitation* stage.

The highest initial rate of improvement we have studied comes from practice involving one circuit per day or a constant time interval of twenty-four hours. As shown in figure 3, the facilitation portion of this curve forms a straight line on double logarithmic paper. The adaptation portion of this curve strikes the facilitation line at the sixth circuit. As will be shown later, many forms of practice eventually reach this particular facilitation level but only after much longer adaptation practice than is required under the once-per-day conditions.

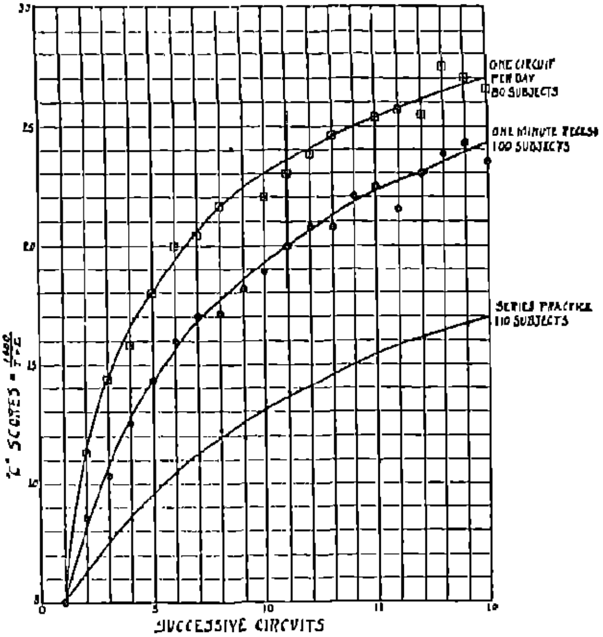

FIG. 2. IMPROVEMENT AS A FUNCTION OF THE LENGTH OF RECESS

These curves are made from the median scores taken from table 2. The subjects are all inexperienced. A slight selection was made to secure subjects of equal initial ability in the different groups so that all question of differences of native ability as an explanation for differences in the learning curves would be entirely eliminated.

1. Time interval practice. The data presented in figure 2 and table 2 show clearly that the learning is higher for time interval than for series practice; and, in the early part of the learning curve, is higher for the longer than for the shorter time intervals. In addition to the data shown in the figures we have secured (1) data for two-minute intervals, and here the curve is above that for one-minute intervals; (2) data for intervals of one hour, and here the curve lies between that for two minutes and that for twenty-four hours.

2. Mixed or broken practice. If we consider a practice such as that shown in curve A of figure 4, where the practice consists of groups of twenty circuits, the circuits being separated by intervals of one minute and the groups by intervals of twenty-four hours, it will be seen that a negative factor enters in to depress the efficiency of initial circuits after the first day; also the facilitation line for this type of practice never reaches that for once-per-day practice. This depression also occurs if the circuits within the group are separated by longer time intervals; but the depression is not so great and the recovery is much more rapid in the case of the longer intra-group intervals. If instead of the one-minute intervals within the group we had used two-minute intervals, the smoothed facilitation line of the latter would rise to the level of the one-circuit-per-day practice by the second day. Had we used a group of forty circuits instead of twenty in our curve A practice the facilitation line for this practice would rise to the level of that for the one-circuit-per-day practice by the third day. If the time interval be kept constant the curve for the two-minute interval practice rises to

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FIG. 3. DRAWING SHOWING A PLOT OF THE MEDIAN C SCORES OF 80 SUBJECTS FOR 60 CIRCUITS OF PRACTICE UNDER CONDITIONS OF 1 CIRCUIT PER DAY

The plot is made upon double logarithmic paper. The smoothed line in curve II is a continuation of the line shown in I. The first five stations (station one cannot be shown in the graph but may be found in table 2) constitute the *adaptation* portion of the curve and do not enter into the *facilitation* line, extending from the sixth to sixtieth circuits. The initial station in curve I, is the B score for the facilitation line. The x ordinates for curve I should be read from *1* to *10* and for curve II from *10* to *100*. The smoothing of the facilitation line was determined algebraically from the equation $\log C = \log B + n \log x$. (See text.)

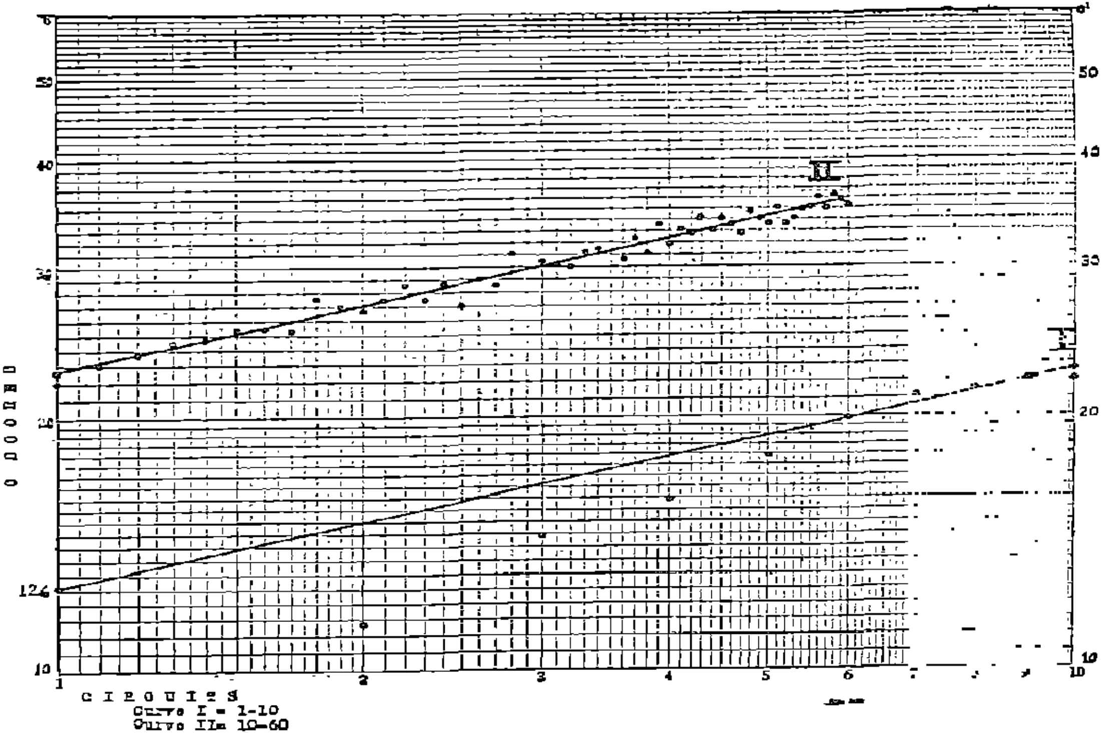
SECONDS
60
50
40
30
25
12.6
10
1
2
3
4
5
6
7
10
II
CIRCUITS
Curve I = 1-10
Curve II = 10-60

Fig. [illegible]

the facilitation line of the once-per-day practice by the twentieth circuit, and the curve for the one-minute interval practice rises to the once-per-day facilitation level by the thirtieth circuit.

Series practice—practice without time intervals presents a number of interesting phenomena. As shown by curve B in figure 4, improvement in this type of practice is terminated by fatigue by the fiftieth circuit. If instead of a long series of circuits we select a short group of, say, twenty circuits in series, and have these groups separated by a twenty-four hour time interval, a curious phenomenon is observed: no depression follows the long time interval (table 3, columns 13 and 16); instead, the time interval brings about a marked improvement. In such a practice the facilitation line of once-per-day is reached by the one-hundredth circuit. This location of the facilitation level in series practice is, of course, dependent upon the number of time intervals inserted, since the facilitation line can never be reached by one continuous series.

3. Cancellation of growth differences. From the above discussion, it can be seen that growth differences, due to varying length of the time interval, can be eliminated by the time the facilitation stage of the learning is reached in all cases of constant time interval practice; and in all groupings of circuits, where the interval within the group is long enough to overcome the depressant effect of the change from the short to the long time interval. For example, the practice consisting of twenty

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FIG. 4. A. Plot showing data from a practice with 100 subjects doing 20 circuits per day, with one-minute intervals between circuits. First 10 circuits may be read from table 2. The dot stations are the median *C* scores of the group for each circuit. The encircled stations are the quartile points found from the distributions of 100 scores where each is the median of a subject's daily practice of 20 circuits. The *B* scores for the quartile lines are $Q_1 = 10.3$, $Q_2 = 11.5$, $Q_3 = 12.6$.

B. Curves drawn for the data secured from 110 subjects doing 60 circuits in series. The stations are plotted from the average of ten consecutive stations. (The curves are so close to linear that this holds for intervals of ten circuits.) Extreme fatigue following fiftieth circuit led to termination of practice at sixtieth circuit. Due to constriction of quartile lines this is not considered a *facilitation* level.

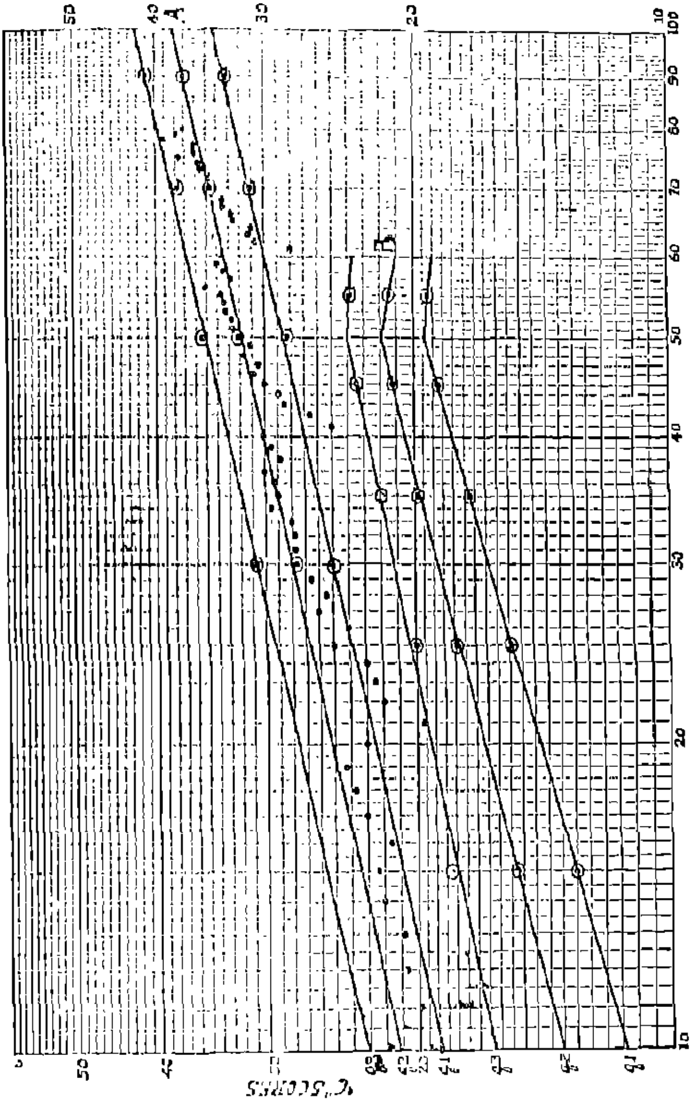

FIG. 4

circuits per day with intra-group time intervals of one minute never reaches the facilitation line of once-per-day practice;

TABLE 3

*Showing the effect of time interval and series adaptation upon subsequent circuits in series**

NUMBER OF CIRCUIT	RECESS PRECEDING CIRCUIT	Q_1	Q_2	Q_3	NUMBER OF CIRCUIT	RECESS PRECEDING CIRCUIT	Q_1	Q_2	Q_3	NUMBER OF CIRCUIT	RECESS PRECEDING CIRCUIT	Q_2	NUMBER OF CIRCUIT	RECESS PRECEDING CIRCUIT	Q_2
1		3.1	4.0	7.0	21	0	20.4	23.3	26.5	1		5.5	21	24 hr.	18.4
2	2 m.	3.5	6.8	11.0	22	2 m.	24.7	26.7	31.3	2	0	8.7	22	0	20.0
3	2 m.	8.3	11.3	15.5	23	0	20.6	25.5	28.0	3	0	9.6	23	0	20.0
4	2 m.	8.7	13.4	17.5	24	2 m.	24.0	27.7	31.5	4	0	10.2	24	0	20.0
5	0	9.3	13.0	16.8	25	0	23.0	25.8	30.3	5	0	9.5	25	0	21.7
6	2 m.	13.5	16.0	20.2	26	2 m.	25.7	30.2	33.6	6	0	11.7	26	0	21.3
7	0	12.0	15.5	18.7	27	0	23.2	28.0	32.7	7	0	11.0	27	0	19.7
8	2 m.	14.5	16.8	22.0	28	2 m.	23.7	27.2	33.2	8	0	11.9	28	0	21.8
9	0	14.3	18.3	22.0	29	0	22.7	26.5	34.0	9	0	13.2	29	0	20.3
10	2 m.	16.5	20.8	23.6	30	2 m.	25.7	30.5	35.3	10	0	12.7	30	0	23.6
11	0	15.7	18.8	22.7	31	0	23.5	27.7	34.3	11	0	13.1	31	0	22.1
12	2 m.	18.3	20.9	25.5	32	2 m.	27.4	32.0	35.5	12	0	14.2	32	0	23.0
13	0	16.6	20.6	23.4	33	0	24.0	28.5	33.7	13	0	13.0	33	0	22.4
14	2 m.	17.7	23.0	26.0	34	2 m.	26.5	31.5	36.0	14	0	14.3	34	0	22.8
15	0	17.3	22.3	26.0	35	0	23.8	29.4	33.7	15	0	15.0	35	0	22.5
16	24 hr.	16.9	19.5	24.0	36	2 m.	26.0	32.2	35.8	16	0	14.4	36	0	24.9
17	0	17.5	20.0	24.6	37	0	23.0	29.5	35.2	17	0	17.0	37	0	22.3
18	2 m.	19.5	23.6	28.5	38	2 m.	27.2	31.2	38.4	18	0	15.5	38	0	23.8
19	0	18.5	21.6	25.7	39	0	25.3	29.3	35.3	19	0	17.0	39	0	22.3
20	2 m.	21.7	26.0	31.5	40	24 hr.	26.0	29.3	34.7	20	0	17.1	40	0	24.1

* The data in this table show the effect of adapting the subjects to time interval conditions (the left two-thirds of the graph) and then shifting to circuits in series to study the effect of time interval adaptation upon the series circuits. Between the first and second, second and third, third and fourth circuits, time intervals of two minutes are interpolated. Following this, every odd numbered circuit is in series throughout the forty circuits of practice. It will be noted that every series circuits, except the seventeenth, shows a marked fall in efficiency over the preceding time interval circuit. Fifty-eight subjects were used in this test. The right third of the table shows the effect of first adapting to series practice and then inserting a time interval between the twentieth and twenty-first circuits. There is no inhibition of improvement in series circuits following the time interval and improvement takes place across the time interval. Twenty subjects were used in this test. All subjects were inexperienced. Quartile points are shown in the first test to show that the entire group are similarly affected. All scores are C scores or $\frac{1000}{T+E}$.

while, with intra-group intervals of two minutes, the line is reached by the thirtieth circuit. These details will be discussed more completely in our analysis of adaptation phenomena and in the quantitative studies of the learning curve.

4. Fatigue and differences in adaptation. In the past it has been customary to explain by recourse to the protean conceptions of fatigue and forgetting all that we have interpreted tentatively as due to growth and adaptation processes. A careful analysis of our data, however, seems to show that fatigue, as we know it through experimental research, cannot explain these growth differences; and the conception that the time interval is responsible for certain growth and adaptational changes seems to be forced upon us. The forgetting factor seems also to be explicable in terms of adaptation.

If we compare scores from a time-interval practice with those from a series practice, we see that the differences cannot be due to fatigue. In table 2, the series curve and the one-minute curve start at the same point, then separate, and by the fourth circuit the station on the series curve is 68 per cent that of the one-minute station; and this constant percentage is maintained, with slight wave motion, to the fiftieth circuit of practice. Fatigue would not produce such initial differences and then stop abruptly. Also, if fatigue were operating in series practice it would appear that shorter groups of circuits should show steeper slopes than longer groups, which is not at all the case. In the adaptation part of the curve (see table 2) there is a constriction of scores observable when quartile points are plotted; and this constriction is very much greater for series practice than for recess practice, and decreases with the increase in the length of the time interval. In series practice, the pre-facilitation levels, therefore, show much greater slopes for the low individuals than for the high ones; in other words, the individuals requiring longer time to make the circuits are the ones making the greater improvement, which is decidedly against the conception that fatigue is operating here to produce differences in rate of improvement.

5. Growth and adaptation factors. But what can develop in the adaptation stage of the learning curve which would depend so largely upon length and number of time intervals? In the writer's opinion it is a pattern of coördination which, through certain growth processes, rises in its capacity to endure stimulation: it is growing in adaptation. As the writer pointed out in an earlier article (Psych. Rev. Mono. Sup. No. 124), the neuromuscular pattern seems to involve a synthesis of elements which, after the time interval, approach simultaneity in their function; while, before the interval, they functioned in succession. The conceptions of nerve center changes through synaptical growth as presented in the work of Kappers and Dercum would seem to be adequate to account for the growth of these patterns. However, the conceptions of change in synaptical resistance, in our own analysis, seem to be utterly incompetent to account for the findings.

When one considers the growth taking place in once-per-day practice and compares this with that in series practice, where the only difference is one of time interval, the view seems unescapable that we are dealing with a contribution the neuromuscular apparatus itself is making to the learning process. The efficiency of this apparatus would seem to depend upon certain growth processes, and also upon its own inner state, which in turn would be expected to vary with health, heredity and emotional state. The writer is convinced that these growth processes cannot be explained in terms of such devices as frequency, recency or satisfyingness. Surely satisfyingness would work as readily in series practice to "fix" or "stamp in" random movements as it would in a practice with time intervals. One might even be permitted the opinion that this principle of selection of random movements ought to work better in series practice. We have already shown that in the facilitation portions of the curve the improvement, under certain conditions, is a function of the number of repetitions; but it will be recalled that by such time all growth differences due to variation in length of time interval have disappeared.

Certain aspects of our adaptation phenomena, however, do not appear to be reducible to growth of pattern; at least we have not been able to so interpret them. If a subject be adapted to time interval conditions in any part of the learning, a shift to series practice conditions involves two distinct effects: first, there is a noticeable fall in efficiency beginning with the first series circuit (table 3), and second, an inhibition of improvement in the series circuits, which will endure for a variable number of series circuits dependent upon the extent of the time interval adaptation.[3] It should be recalled that if a subject be first adapted to groups of series circuits he will improve throughout each series and also in the time interval separating the groups (see columns 13 and 16, table 3). Here we see the effect of early adaptation to the time interval or series practice conditions and we have no explanation for this in terms of growth.[4]

It is difficult to indicate the temporal length of this inhibition since it depends upon the degree of time interval adaptation. A subject who began his mirror tracing in the laboratory, and has had ten circuits separated by two-minute intervals, will be adapted to the point where series of ten circuits may be run off with no improvement whatsoever within the series. Such an adaptation reappears after a long recess of a month or a year upon the introduction of one or two of the short intervals. This device for the production of inhibition of improvement in series practice is the one, mentioned in earlier pages, we have used to study the relation between the time and error quantities at various levels of the learning curve.

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[3] In our references to inhibition of improvement for series practice following time interval adaptation it is not intended to convey the idea that these circuits in series count for nothing. In fact, such a view is far from the truth. If a careful study of the data in columns 1 to 10 of table 3 be made, it will be found that the improvement for the second day—beginning with the sixteenth circuit— is too great to be accounted for solely by the circuits preceded by recess. It appears that after the recess of one day the early series circuits begin to show their effect, which is very nearly what would have resulted had all the circuits been preceded by time intervals. However, during the first fifteen circuits the learning curve is precisely what should have come from the time interval circuits alone, i.e., before the long recess the series circuits have no effect upon the learning curve. While the interpretations differ widely, yet the observation that a marked improvement under conditions similar to the above follows a long time interval was made by Book in his classical study of typewriting. (See W. F. Book, The Psychology of Typewriting. Gregg Publishing Company.)

[4] In an earlier analysis of this phenomenon our conclusion was that improvement could not take place at all in series practice, but this interpretation was in error. In order to secure introspections in the earlier stages of practice, we had provided time intervals between circuits and had thus unwittingly secured inhibition of improvement in series practice through adaptation to time interval conditions.

As we have pointed out, a phenomenon arises as the result of adaptation which is identical with forgetting, or at least very similiar to forgetting. When a subject is making a group of circuits each day, the circuits being separated by short time intervals, and the groups separated by one day, a depression follows the long recess (see curve A, fig. 4). This is quickly recovered from and, if the intra-group interval is as long as two minutes in a group of twenty circuits, or the group is as long as forty circuits with an intra-group interval of one minute, the normal facilitation line is eventually reached. We have in this phenomenon a case of adaptation to short time interval, followed by a depression upon change to a long time interval. The longer the intra-group interval the less the depression following the long inter-group interval. In practice involving one circuit per day, an interval of a week leads to no depression at all. The depression seems clearly to be a matter of the disproportion between the length of the intra-group interval and the interval between the groups. This, to the writer, seems to be an adequate explanation of forgetting in motor learning. There are marked individual differences here and certain psychopathic subjects lose enormously from this depression factor, but it is not true that low subjects, on the whole lose more than high ones.

6. *Relation to biological adaptation.* The writer does not find it a simple matter to generalize these adaptational phenomena. It can be seen that inhibition occurs for those conditions which produce the lowest rate of learning, and in general it can be seen that intermittent stimuli which are free from inhibition are the rule in nature rather than the exception. A factor which seems to point to biological adaptation is seen in our conception of synthesis following the time interval. A

movement following a time interval is made up of a synthesis or simultaneous functioning of muscular elements which functioned *alternately before the recess* as right and left zig-zag movements across the path. The coördination resulting from this synthesis is not in a sense a new movement at all; if, however, series practice is begun, entirely new movements do arise. It is no doubt this appearance of new movements which lowers the efficiency and produces an inhibition—as indicated in the preceding section—at the time when improvement is coming from a growing synthesis. If an animal is escaping from an antagonist the coördinations already built up may avail but, if they do not, series stimulation will result which leads to a great change in the character of the movements, not to the building up of a new coördination.[5] Overstimulation of a pattern leads to breakdown of the coördination: its endurance capacity is exceeded; and this leads to the appearance of many rapid and incoördinated movements.[6]

VI. QUANTITATIVE ANALYSIS OF THE DATA

1. Constant time interval. By referring to figure 3, which is the curve for twenty-four hour recess interval practice, it can be seen that this curve is readily divisible into two distinct parts. The first part begins with the first circuit and continues until it strikes the straight line of the second part. As indicated on previous pages, the first part of the curve we have called the adaptation portion, and the second, the facilitation portion. Beginning with the sixth circuit of the twenty-four hour practice and continuing to the end of practice—we have carried this to over two hundred circuits with small groups—it will be seen that a straight line will smooth all of the points when they are plotted on double logarithmic paper. This means that the equation of this portion of the curve is of the type $C = Bx^n$, where C is the height of any ordinate or, in other words, the endurance capacity of the pattern at any point: B is a constant which can be read on the initial ordinate; n is a constant referring to the slope of the line on logarithmic paper; and x indicates the number of the circuit. In the once-per-day curve, $B = 12.6$ and $n = 0.25$. The curves for all constant interval practices—we have studied twenty-four hours, one hour, ten minutes, two minutes and one minute—reach this same facilitation line and proceed indefinitely toward the right at the same slope; however, they do not reach the facilitation line at the same point. The one minute curve reaches the line at the thirtieth circuit, while the twenty-four hour curve reaches the line at the sixth circuit.

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[5] It is this failure to distinguish between a coördination and random movements which, in our own opinion, constitutes the chief objection to Thorndike's conception of motor learning. A growth in coördination is in no sense a perseveration of certain random movements: it is essentially a synthesis of past efforts where inequalities cancel each other.

[6] An excellent illustration of the sudden appearance of new movements in an overstimulated pattern or one with very low endurance capacity is afforded in the behavior of maniacal patients. As is well known by careful observers, the supreme difficulty encountered in handling these patients is due to the sudden appearance of new movements—they break away from one's grasp—and not at all to the great energy they show. The encounter for the patient involves the breakdown of patterns of coördination and the emergence of random movements.

If logs are taken of the equation

$$C = Bx^n, \tag{1}$$

we have

$$\text{Log } C = \log B + n \log x \tag{2}$$

which is seen to be the equation of a straight line in logs, where $\log B$ is the added constant and n the slope. The stations plotted in figure 3 are the medians taken from table 2. To avoid confusion, the first and third quartile points are not plotted in the figure but, when plotted, they also give straight lines which are parallel to the median line shown in the graph.[7]

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[7] Tables of residuals as checks on the validity of our determination of the line of the medians and the constants are not given, since these can be so readily verified by inspection of our log graphs. The constants were determined by the method of simultaneous equations. The data are divided into two equal parts and for each is formed an equation in log form with the same B and n constants; from these, using logs of scores and stations, the constants are found algebraically.

The adaptation portion of our curve does not admit of such simple mathematical methods as shown above. In the twenty-four hour curve, the adaptation portion is very close to linear, but in all other types of practice it departs widely from this form. At present it does not appear to us that much can come from a study of the equation of the adaptation portion of the curve, and for this reason we have given it little attention. As a clinical device, the *B* constant seems to furnish all that could *come from an equation of the adaptation curve. It represents* the upper limit of growth in pattern formation, less the increment coming from facilitation during the adaptation period; and, since it is a constant, barring the wave motion factor to be discussed later, it serves as a perpetual measure of the functional capacity of these growth or adaptational patterns. However, *initial* adaptation, measured from the first few circuits, differs from what we get with the *B* constant. In certain clinical subjects the initial adaptation may be greatly depressed, while the *B* score is normal. This will be taken up later.

2. Mixed or broken practice. When mixed or broken practices are used, such as groups of twenty circuits with an intra-group interval of one-minute and a recess of twenty-four hours between groups (see curve A, fig. 4), there is a depression factor which follows the long recess. As pointed out in the preceding pages, this may lead to a *B* constant lower than that for constant intervals, in case the intra-group interval is as short as one minute and the group not longer than twenty circuits. A device other than the one presented for constant interval practice, must be used for determining the facilitation line in such practice. The depression is soon eliminated by practice and, it would seem, should be given little or no weight in determining the facilitation line in such practice. In our clinical work we often use the amount of the depression below the facilitation line to study pathological types, but the line must be determined independently of the depression to make this possible. We have found the median of a group of circuits the best representative measure of the efficiency of that group. When twenty circuits are used and the median for this group is set on the appropriate ordinate on long paper, a facilitation line is found which is parallel to that for constant interval practice. As previously shown, the B score will be the same as for the constant interval under certain conditions, but under the conditions operating in the practice shown in figure 3, the B score falls to *11.5* for a normal group, as compared with *12.6* for the normal constant in constant interval practice.[8]

3. Constancy of n for all subjects. We have already indicated that the facilitation lines for all types of practice are parallel on log paper, which means that the slopes of the log equations are equal.[9] From this it would be a good guess that all individuals, whether high or low in efficiency, might have the same slope for their facilitation lines. This turns out to be the case and n, which is equal to *0.25*, is the universal slope. We have studied about *300* children, *500* insane, and over *1000* low, normal and superior adults among college students, and have invariably found the same average slope of the log equation in facilitation practice. It is of interest that many of our insane subjects are well below the normal distribution curve for adults, and yet these have the same slope n. In our study of children of all age levels the slope of the facilitation line is seen to be the same as for normal adults. This constancy of the slope of the log equations for all subjects is not only a thing of much interest mathematically and physiologically, but it simplifies enormously the mathematics involved in the treatment of clinical data. Individual differences and wave motion phenomena can be analyzed most readily.

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[8] The advantages attaching to the use of an intra-group interval of one minute, as against two minutes, which gives the B constant of *12.0* lie largely in the saving of time, since after the first day's practice, a group of twenty circuits can be run off in thirty minutes. Up to the present time no disadvantages have been encountered in the use of the lower constant. The device lends itself readily to all sorts of clinical studies. The effect of drugs, wave motion in pathological cases, and the effects of menstruation, are some of the types of research we have carried out through the use of this type of practice. It is worth noting that the use of the median score in practices of twenty circuits with an intra-group interval of one minute gives a facilitation line which is not affected by the introduction of time intervals between groups as long as six months.

[9] It must be kept in mind that the slopes of the coördinate equation $C = Bx^n$ are not constant, as can be readily seen by differentiation: the x variable appears in the derivative, which indicates change of slope at each point studied. The constant slope of the facilitation line holds only for the log equation or, what amounts to the same thing, the plot of coördinate points on log paper. It is worth noting that the exponent n, while a constant, is not the slope in the coördinate equation; but it is the slope in the log equation, since it there becomes the coefficient of x, as $\log C = \log B + n \log x$.

4. *Significance of the B scores.* The log equations for facilitation practice show, as indicated above, constant slopes for all subjects and all types of practice; consequently, the only term left to show individual differences is the B constant. The B score varies from individual to individual, and in the same individual from time to time; it is only the smoothed facilitation line which gives a constant, and then only for certain ranges of data under observation. It is well to note that the evidence favors variation from time to time in the B score rather than in n. When the same slope holds for all subjects, it is inconceivable that the slope factor would vary from time to time in any one subject to give rise to changes in efficiency. The B score, which we have defined as the functional capacity of a pattern built up by adaptational growth processes to the point where *all* future changes will be of a constant character—as in facilitation—is clearly the term which would vary. In the log form of our equation, the term $\log B$ may then be regarded as a measure of the functional capacity of this pattern to endure stimulation, and $n \log x$, as a constant increment—from subject to subject—due to facilitation; in which case, the B term becomes a variable factor, varying from subject to subject, and with every change of state of the adaptational pattern in any one subject.

The B score has the same meaning at all points within the facilitation practice. This is readily seen from curve A, figure 4. Here the median C score $\left(\frac{1000}{T + E}\right)$ is found for each of one hundred subjects in a practice of twenty circuits per day, circuits being separated by one-minute intervals. These median scores for each day are thrown into a distribution and the quartile points found and set on the appropriate ordinate for the different days of practice. The first and third quartile lines are parallel to the median line, that is they have constant B scores, on the average, throughout the successive days of practice; and no constriction or change of slope is found as practice continues. This indicates that the deviations of the log scores are constant at all levels of the facilitation curve. Standard deviations of the logs of these median *C* scores also average a constant; also standard deviations of the *B* scores found for the median *C* scores average a constant. This last is the procedure followed throughout our clinical studies, that

TABLE 4

*Distribution of 750 B scores from 250 college students**

CLASS INTERVAL	FREQUENCY
17–17.9	3
16–16.9	11
15–15.9	11
14–14.9	38
13–13.9	106
12–12.9	130
11–11.9	150
10–10.9	128
9–9.9	101
8–8.9	40
7–7.9	22
6–6.9	10

Mean = 11.5
Median = 11.5
S.D. = 2

* Each subject does twenty circuits—one-minute interval between circuits—in each day's practice. The twenty circuits are arranged in serial order and the median found. From this median score, representative of the day's practice, the *B* score is found for each subject. The table presents the *B* scores for the second, third and fourth days of practice for each of 250 college students.

is, the *B* score is found for each median *C* score; and this gives us a score free from the effects of practice.[10]

Table 4 shows the distribution of 750 *B* scores gathered from three days of practice from each of 250 college students. The students were equally divided as to sex and were drawn from all four college classes, with students from the sophomore class predominating. These standards have been found most satisfactory for studying college students, but are too high for adults of the general population; yet not so great a disproportion exists here as in intelligence tests. These standards have been used with adults of the general population for purposes of clinical study, where only extreme deviations are of interest.[11]

VII. ANALYSIS OF STABILITY

1. The B score as a measure of stability. The *B* score can be defined as the basic endurance capacity score, or the measure of the functional capacity of a sensori-motor pattern built up by growth processes to the point where it undergoes, through repetition alone, a measurable and predictable set of changes called facilitation. As we have indicated, this capacity varies from time to time. In other words, the *B* score becomes a measure of the *stability* of the sensori-motor pattern involved in this type of coördination. We believe that it will be apparent to anyone who has followed the analysis thus far, that this measure of stability must have great clinical significance. However, it is well to keep in mind, that it measures one kind of stability, namely, that of a particular sensori-motor apparatus and, while this function enters largely into many situations in life, it is not a general function and involves no general stability.

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[10] This can be readily done by means of the graph on log paper, which gives fairly accurate results, or by means of the ratio method, which is the one usually employed by us. This method depends upon the constant ratio of points forming parallel lines on log paper. The formula is: individual *C* score is to median *C* score as individual *B* score is to median *B* score. The denominators are read from a table and the computation carried out with one set of a slide rule.

[11] It is worth noting that our findings regarding the *B* score as the basis of individual differences, as well as our development of the equation, are basic for Thorndike's contentions regarding innate capacity, and his further point that practice increases individual differences. A careful analysis of our data will show that individual differences cannot be reduced solely to experience: a basic capacity of some nature is necessary. This last we show varies with every change of state in the functional capacity of the adaptational mechanisms which gives rise to the phenomenon of wave motion.

The author's six years of experience with this as a test of stability in a psychological clinic has convinced him that every ability has its stability or endurance capacity aspect, and that here we are dealing with the stability aspect of *one* of the most widely used coördinations; more cannot and ought not be said. Our analyses of hundreds of psychopathic cases point to the fact that the chief cause underlying these losses of coördination goes back to toxic or abnormal glandular factors. Most toxic states which strike the coördinations built up in the higher nervous system also strike the apparatus upon which this coördination rests; and this is without doubt the basis of our success in studying the behavior of many psychopathic conditions. However, it is both wise and expedient to recognize the fact that some extreme psychopathics exist which are independent of the coördination studied here.[12]

2. Physiology of stability. It is too early in the development of this type of study to venture a serious analysis of what happens physiologically in the adaptation and facilitation portions of the learning curve, but no harm can come from a tentative ordering of the field for purposes of orientation. It seems to the writer, as often noted in these pages, that in *adaptation* we are dealing with actual growth of new pattern which arises according to processes similar, possibly, to the stimulo-taxis conceptions of Dercum[13] and Kappers.[14]

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[12] The author is convinced that the greatest danger facing the application of experiment to the clinical field lies in the tendency to premature generalization. The applications of the Binet tests and the conceptions of Freud to the clinical field are cases in point.

[13] Dercum, F. X. The Physiology of Mind. W. B. Saunders Co. Philadelphia, 1925.

[14] Kappers, A. Phenomena of neurobiotaxis in the central nervous system. Folia Neuro-Biologica, 1913, vol. 7, pp. 55 56.

In *facilitation*, we are dealing with something comparable, perhaps, to condensation of this pattern. There is, of course, facilitation taking place from the very first circuit of the instrument, but this is mixed with growth factors in all pre-facilitation stages of the learning. The term condensation is intended to point to some type of molecular rearrangement, comparable in a remote way, perhaps, to what takes place in a rubber band which is undergoing stretching. It is interesting to note that the equation connecting the weight applied and the amount of elongation of a thin rubber band is of exactly the same type as that for our facilitation curve. The pressure-volume relations of a gas may also be put in this form. The adiabatic gas law is usually stated in just this form.

It is our opinion that of the two stages of the learning curve, adaptation and facilitation, the latter is much more clearly reducible to mechanical processes than the former. The former involves that enormously complex series of processes taking place in growth itself. The writer is of the opinion that these processes are initiated by some stimulus, as provided in Kapper's conceptions; but that they continue through the time interval to complete changes and processes started by the stimulus, must also be considered. There is no evidence that patterns once built up are ever lost, but that they change from time to time in endurance capacity is one of the basic findings of this investigation. The causes of the regular circuit-to-circuit waves are unknown but prolonged changes in condensation seem to depend, in our experience, upon toxic and emotional or shock factors.

3. Wave motion phenomena. At no point in the study of this coördination does the mathematical analysis of the function give us greater insight than in the study of wave motion. We shall confine our treatment to the analysis of wave motion in the facilitation portion of the learning curve. In curve A, figure 4, it will be seen that the deviations in logs are constant at all levels of the learning curve. Standard deviations of the logs of the scores also average a constant for the various levels of the facilitation part of the learning curve. Probably the simplest way to interpret this comes through the fact that constant deviations in logs of scores as shown in the learning curve means a constant relation between size of score and the amount of deviation; in other words, the deviation is a constant percentage, on the average, of the size of the score. This holds, as would be expected, not only for distributions, as shown in the graph, but also for the average wave motion of individuals from circuit to circuit; and this when the deviation or wave motion is determined by any device whatsoever.

It is a simple matter to find the wave motion of individuals through use of the smoothed facilitation line for each subject. Deviations for scores above the line are determined by finding the percentage of the actual to the smoothed score; and for scores below the line, by the percentage of the smoothed to the actual score. These percentages will average a constant for all levels of the distribution curve. Certain individuals will have greater wave motion than others, as would be expected, but when a large group of subjects is studied by being arranged in ascending series, according to size of score, it is found that the average wave motion, as expressed in percentage of mean score, is constant for the different quarters of the group; that is, the wave motion is, on the average, a constant percentage of the size of the score. In absolute value, it is greater for the large than for the small scores. This holds for both our raw scores $(T + E)$, and our conductance scores $\left(\frac{1000}{T + E}\right)$. Thus it will be seen that the highest wave motion—actual, not percentage—in conducting capacity falls to the most efficient subjects, while the highest wave motion in raw scores falls to the most inefficient subject. On a percentage basis, wave motion is, of course, equal for our conductance and resistance scores.

The wave motion depends also upon the conditions of practice. When constant time intervals are used the average wave motion is fairly constant for a certain range of intervals. Thus, in intervals from one to ten minutes in length, the average wave motion is 12 per cent of the score. For constant intervals of one day the wave motion is 15 per cent of the score. The wave motion for series practice is the highest found in our experience, and in our study of 110 subjects the average wave motion was 20 *per cent of the size of the score. In all of the above cases the wave motion is the average ratio of the actual scores above the smoothed facilitation line to the scores on the line.*

When subjects with high percentage wave motion, computed as above, are isolated from the group for special study, it appears that there is a positive correlation between size of wave motion and pathological nature of the subject, as determined from his history. However, this is considerably less than the large negative correlation to be found between the *B* score and the pathological nature of the subject, and also between the *B* scores and the effect of drugs and other depressant factors.[15] These studies, as well as our quantitative analysis of data from clinical subjects, must be reserved for more extended treatment in later articles.

Correlational studies also throw considerable light upon these wave motion phenomena and also upon the utility of our measures of stability. When correlations are found between totals or averages of circuits made on the same day they run fairly high. In one group of one hundred subjects, in a practice of twenty circuits per day with one minute intervals between circuits, the correlation between the sum of the eleventh to fifteenth and sixteenth to twentieth circuits in each day's practice, ranges from *0.75* to *0.90*, with an average of *0.85* ± *0.003*. When the correlations between *B* scores of the same one hundred subjects,—each *B* score being derived from the median *C* score of a group of twenty circuits with inter-group intervals of one day,—are found for successive days, they range from *0.60* to *0.75*, with an average of *0.67* ± *0.01*. The drop in the correlation between *B* scores for successive days is no doubt due to the appearance of variations in physical state, which change the endurance capacity from day to day. The menstrual period in the females is a case in point and will account for some of our drop. When averages or totals of successive days are used correlations are of course increased. In a group of 80 subjects in a one-circuit-per-day practice, the correlation between the sum of the eleventh to fifteenth and sixteenth to twentieth circuits is *0.92* ± *0.006*. It is well worth noting that in a study of stability from day to day the utility of the scores does not rest solely upon a high degree of self correlation. If averages of many days are used, one of the most desirable insights into the clinical nature of subjects is obscured.

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[15] In general there is marked agreement between the findings recently reported by Hollingworth (*Journal of Experimental Psychology*, Vol. VIII, pp. 190–209) and our own. However, the present writer is unable to attach much meaning to Dr. Hollingworth's correlations between stability indices (reducible as we take it to wave motion in the present study) and the effects of alcohol, for example. A large group, studied, as we have ours, by means of wave motion from a central smoothed score, will not give, in our experience, a good correlation between wave motion and the effect of alcohol; but there is a fine correlation between performance ability and resistance to alcohol, as pointed out by Dr. Hollingworth. However, our lack of agreement may depend upon fundamental differences between our wave motion and his stability index, which we have regarded as properly reducible to the same thing. It is worth noting that our *B* score is the basis of our stability index, while Hollingworth differentiates between performance capacity and stability index. With us stability is endurance capacity; with him it is a phase of variability.

There is no question but that initial adaptability, as measured by the earlier circuits of the practice, must be considered as a separate function from stability, as measured by the *B* score. Correlations between initial adaptability and stability for groups of one hundred college students will average about *.40*; and this is true when the self correlation in the facilitation, or stability, levels is over *0.80*.

4. Emotional states. These states are so closely connected with stability or capacity to endure stimulation that it can be said that a vast majority, probably 90 per cent, of low stabilities are of the highly emotional type. This is not because they are so variable from moment to moment, as is usually supposed to be the case with these types, but rather in our experience, because of low basic capacity to endure stimulation. As would be judged from our analysis of wave motion, we are convinced that emotional subjects in general do not vary more than normal subjects, when wave motion is considered as a percentage of the score; rather, it is a case of their falling to a low level before certain stimuli, and to a level more nearly normal in other cases. This does not mean that they vary more than do normal subjects when facing one specific source of stimulation. However, it can be seen that a subject who falls to a low level in this coördination has a very extensive nervous apparatus, the one underlying this function, sensitive to the presence of toxin or, through heredity, capable of only a low resistance to stimulation. It is upon this that our diagnosis of general emotional types depends. If the coördination we are studying were less extensive, our diagnosis of general emotional instability would have small utility.

Our findings seem to support the Dewey conception that emotions are breakdown phenomena, which present the picture of coördinations functioning with lowered efficiency. The conception that the neuromuscular systems which underlie these coördinations are sensitive to the presence of toxins, comes from our general clinical experience and from the additional fact that, as our research seems to show, these coördinations are simply built-up neuromuscular patterns, with variable capacity to endure stimulation. We are convinced that the popular conception, that coördinations are dependent upon the formation of connections, has slight utility unless these connections are conceived as bonds with variable capacities to conduct. This variability would seem to involve a ready tendency to be depressed.[16]

5. Sex differences. In our earlier studies of this coördination, we were much impressed by the sex differences obtaining in initial portions of the practice. The female college student was found to be superior to the male in initial adaptability. This is so great that, when unselected groups of one hundred of each sex are studied, the experimental coefficient, McCall's device for showing reliability of a difference, will average in the neighborhood of *1.6*, indicating a difference too great to be due to chance. We have usually used the sum of the sixth to tenth circuits, inclusive, or the fifth circuit in serial order, to determine this adaptability. Earlier portions of the curve cannot be used since, at such points, the standard deviation is too large to give a reliable difference.

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[16] The best discussion of this nature of nervous coördinations we find in Henry Head's analysis of "Vigilance—Conceptions of Nervous and Mental Energy," Brit. Jour. Psych., 1923. We are not interested in his notion of vigilance but wish merely to recommend the article as an excellent discussion of certain neglected phases of nervous function.

The differences shown above for adaptation disappear as soon as the facilitation level of the curve is reached. This would seem to point to the fact that our differences were due either to fundamental differences in adaptation or to experience factors.[17] We have not the space to go into the merits of this question, but it may be worth stating that the author believes the sex differences in the adaptation portions of the curve go back to fundamental differences in adaptive capacity. When children of various ages are studied, it is found that the sex difference does not appear until after pubescence. This does not settle the matter, of course, since some would contend that the female's extensive experience with the mirror begins at about that time. However, if there is a carry-over from this general use of the mirror to our function, it is not evident in the results of large numbers of psychopathic females who, though ardent students of their own mirror images, give very much lower records for initial adaptability than for stability, as measured by their own facilitation scores. On the whole, the evidence is very convincing that the post-pubescent male has his initial adaptability depressed by some glandular factor associated with the coming of sexual maturity.

6. Relation to intelligence. This function has a very low correlation with any of the established measures of intelligence. The correlation is so low as to point very clearly to the fact that the two must be considered as almost completely independent of each other. Correlations between *B* scores and intelligence scores, secured from *Army Alpha, Otis Higher, Mentimeter* and *Thurstone* tests, range from *0.20* to *0.25* with small probable errors. When initial adaptability is correlated with these measures of intelligence the correlation rises noticeably and then ranges from *0.30* to *0.38*. When children are measured by the Stanford-Binet, and the age factor held constant, the correlations with *B* score will average *0.20* ± *0.03*, and with initial adaptability they rise to *0.37* ± *0.02*.

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[17] Our subjects are all inexperienced so far as use of any apparatus for studying mirror tracing is concerned. We refer here to the possibility of experience arising from the general use of the mirror.

The writer feels that the rise of correlation of intelligence with adaptability over that for stability grows out of the fact that subjects with low initial adaptability in this function are in general slow learners, and that the learning element enters somewhat in the tests. When maze learning is reduced to conditions of adequate control, the correlations for initial adaptability in the maze and in our coördination often rise as high as *0.75* for college students. When the *Army Beta* tests are given with modifications, involving verbal instructions and change of time, the correlations with initial adaptability average about *0.50*.

In order to throw more light upon initial adaptability, we have made a small study of aged subjects. In almost every case *the standing of these subjects in adaptability* is much lower than in stability, when both are compared with the same traits in our standard college group. This is so much the case in our studies that old age can be considered as involving lowered adaptability rather than lowered stability, although the latter is found in very advanced years. Individual difference seems to play a very large part in determining the time when lowered efficiency may be expected. Our data, 20 cases between 60 and 80 seem to point to the fact that extremely low adaptability is found more among males than females.

We have made a study of three hundred children and adolescents ranging in age from six to eighteen years. It is found that the normal child of six years has a stability about *65* per cent that of an adult; a child of ten has a stability *75* per cent that of an adult; and an adolescent of *eighteen* years has, on the average, adult stability.

VIII. STUDY OF TYPES

Space is not available here for a satisfactory study of clinical types. These will be presented in special studies later, but at present enough can be presented in brief form to show the possibilities of this type of research in the clinical field. We have studied stability in focal infection, the college student, menstruation, administration of alcohol and other drugs, and among patients in a mental hospital. A few of these will be discussed briefly.

1. College students. In our study of college students we have been interested in determining the lower limits of stability where college work could just be done. Our *B* scores have been turned into sigma index scores, or as we call them, *stability index* scores, where the normal is *100* and a deviation of one sigma from the mean is given *20* points on the index scale. College students with stability indices as low as *70* this includes about *7* per cent of the college population as measured by us—can rarely do wholly satisfactory work. When satisfactory work is done under stability as low as this it will be found that the student is doing only part time work or is taking only specially favored subjects. As the higher classes are reached the unstable students more and more find niches adapted to them; the unstable freshman or sophomore is much lower in his class standing than students of the same stability in the senior class. Unstable students in college are not weeded out so rapidly by college standards as is the case with low standing in intelligence.

2. Menstruation. We have made a study of one hundred females with special attention to the fall in stability at the time of the menstrual period. There are enormous individual differences here, some normal college girls being brought to a near pathological level, while others are only slightly affected. Subjective symptoms and stability, while related, do not correlate highly. The period of maximum instability begins shortly before the first subjective symptoms appear, rises to a maximum and falls rapidly at the appearance of flow. The average college girl falls to *80* per cent of normal stability (*St. Index 72*) at the time of her greatest menstrual disturbance.

3. *Patients in a mental hospital.*[18] Aside from our work with college students, our most extensive application of this experiment to clinical fields has been the study of patients in a state mental hospital. Here about five hundred insane were studied for stability. Deviations from normal are very marked. Less than 1 per cent of college students are as low as the median stability in a state mental hospital. The high 10 per cent of adults in a state hospital will average in stability slightly lower than eight-year-old children. The highest instability we found among dements (terminal form, not praecox); and here we saw the clinical picture of extreme old age, where the adaptability is depressed much more than stability. Wave motion in stability parallels change of state in all forms of intermittent or circular insanity, and may be used to predict oncoming changes. The highest stability is found among a small class of dementia praecox simplex patients. A few of these patients, though very low in adaptability, were normal in stability.

IX. SUMMARY

In this study of mirror tracing with an instrument of our own design, called the stabilimeter, we have attempted an analysis of the learning curve under various conditions of practice; have studied the influence of the time interval upon the learning process; have made an analysis of individual differences and have attempted an application of these findings to the clinical field. The learning curve has been divided into two parts, an *adaptation* portion, which begins with the first circuit of the instrument and continues for a variable number of circuits; and a *facilitation* part, which begins at the end of the adaptation part and continues indefinitely. During the adaptation stage of the curve, the improvement has been shown to be a positive function of the length of the time intervals between circuits; in the facilitation stage, the improvement is a function of the number of repetitions. Improvement during adaptation has been interpreted as dependent upon growth processes leading to formation of neuromuscular pattern; while facilitation has been conceived as growing out of condensation of this pattern.

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[18] Our study of the patients in a state mental hospital was carried out at the Utah State Hospital at Provo, Utah. We are greatly indebted to Dr. George E. Hyde, now deceased, former superintendent of the Utah institution, who urged that the investigation be undertaken there and who gave generously of his time in aiding our researches. We are also *indebted to Dr. Frederick Dunn, present superintendent* of the hospital, who has aided us in every way possible.

Scores are found from the time and error quantities. When improvement has become very slight, or is inhibited by special devices, the sum of the time and error quantities is shown to to be constant, i.e., $T + E = R$, for all variations of emphasis upon avoiding errors, from the point where $T = E$ to the point where $E = 0$. R, in the last case, is the time taken to make a circuit with no errors; and $1/R = C$ becomes a measure of the endurance capacity of the patterns formed.

The equation of the facilitation function is of the form $C = Bx^n$, where C is the endurance capacity of the pattern at any point, and B and n are constants. The exponent, n, is found to be *0.25* for the facilitation level of the learning curve, and is constant for all subjects and all types of practice at this level. The B score, basic endurance capacity, may be readily determined, and forms the foundation for a study of stability; and, with the addition of a score for measuring adaptive capacity, a new device for studying clinical subjects is made available. Brief clinical studies have been presented from studies of college students and from patients in a state mental hospital.

TESTS FOR TRANSPORTATION PILOTS

A. J. SNOW

Northwestern University and Yellow Cab Company

Because a number of inquiries have been received, it is felt that it might be worth while to publish a brief statement of the tests that have been developed for transportation pilots. The tests are being standardized and applied, at this time, in the selection of taxicab drivers. However, it is felt that the psychological principles underlying the safe conduct of any transportation vehicle are the same whether it be a passenger or freight motor vehicle, a street car, a subway, an electric elevated line, a steam or electric railway.

While hoping that it would not be necessary to publish anything until the completion of the work, this publication has been forced because of the popular and misleading publicity that has appeared in the newspapers and magazines. We trust that it will be understood that this publicity has been a forced one because of the unyielding demand of the industry. Another reason for the hesitation to publish any results is that the tests are still in the process of making. Even since the publication of parts of the tests for the purpose of illustrations in the recent book, Snow's "Psychology in Business Relations," it has been found advisable to modify the technique and apparatus.

This statement does not attempt to point out the technique used in the development of the test[1] nor the large body of material that has been collected up-to-date. All this, it is hoped, will be published in some monograph series when the work is completed.

The tests are used at this time for the selection of taxicab drivers at the Yellow Cab Company of Chicago as well as in other taxicab companies in the following cities: Louisville, Cleveland, Pittsburgh, South Bend, Toledo, and Omaha. In Omaha the tests are being given by the Omaha Safety Council to any driver—automobile or street car—who wants to avail himself of the opportunity.

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[1] *Snow, A. J., "Tests for Chauffeurs," Industrial Psychology, Vol. I,* No. I.

Up-to-date, in Chicago alone (Yellow Cab Company), twelve thousand applicants have been tested, of whom three thousand are at this time in the employ of the Company. The Company employs a total of six thousand drivers. The rejections, since January first, have been 15 per cent of all the applicants who have aspired to become Yellow Cab drivers. Rejections have been based upon the applicant's inability to pass the psychological tests satisfactorily. The reduction of accidents since January has been substantial.[1]

The following contains a very brief description of the tests used at this time:

MAJOR TESTS:

1. *Physical examination.* This examination is given by a physician and consists of a rigorous examination covering the usual fields such as the eyes, ears, reflexes, blood pressure, Wassermann, heart, lungs, etc.
2. *Intelligence tests.* The tests for intelligence consist of a group of very simple problems in printed form. The pamphlet which contains the tests includes also all the necessary directions and sample problems so that it can be given to a large group or individually without any oral instruction or interpretation except for the taking of the history of the subject. The tests require very little writing. We assume that the subject knows nothing (due to formal education) but what we attempt to teach him while he is taking the test. Of course he is expected to be able to follow very simple directions, be able to make marks and figures, and to copy letters.[2]

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[1] *Ibid.*, pp. 40–44.

[2] For illustrations of the intelligence test, second revision, see Snow, A. J., Psychology in Business Relations, pp. 520–522. The tests as now used, however, have undergone still a third revision.

The time limit is twenty-five minutes. We attempt to measure the intelligence of the individual by the use of the following tests: (*a*) immediate and remote memory, (*b*) attention without distraction, (*c*) attention with distraction, (*d*) span of observation, (*e*) space perception, (*f*) imagery, (*g*) adaptability to unusual situations, (*h*) reason (common sense type), (*i*) learning, (*j*) speed of reaction, (*k*) perseverance.

This revision was of the following nature: (1) We reduced the time from twenty-five to fifteen minutes, obtaining the same distribution, both for the whole test and for parts of it. (2) We eliminated the printed general, introductory instructions and now give these orally, the reason being that since the value of the test is entirely dependent on the subject's understanding of what he is to do, we can better check up on this understanding when the instructions are oral. Our criterion for the giving of instructions is, can the subject *demonstrate* an understanding of what he is to do? (3) We have changed the type of "sample problem." We found that many subjects failed to profit by the usual presentation of the "sample problem" such as the following:

Sample:

Write on the dotted line the name of the automobile that can be spelled with the following letters: DORF... ford... ..

Consequently we changed them to the following type:

8. Write on the dotted line the name of the automobile that can be spelled with these letters DORF... .. . .
The name is FORD.

We tell the subject to read everything between the heavy lines, to avoid having him skip the answer. In this type of problem then, the subject gets a *motor reinforcement* to his learning, and very few fail to profit by the example. (4) We managed to still further spread out the low test scores. (The problem was to compound a test in which the lowest types of intelligence would be spread—differentiated—over as large an area as possible, so that it would be possible to choose carefully from among them.) With the revision, but 1.5 per cent receive 0 for a score. (5) Of course, from experience we were able to eliminate ambiguities and to balance up the test generally.

Theory: In our work, so far, we have discovered that average or superior intelligence is no index to a person's ability or inability to guide a vehicle safely—very low intelligence, however, invariably is an index.

3. *Emotional stability.*[4] Apparatus: The apparatus used in this test consists of an ordinary kitchen table placed in a dark room. The table is equipped with two independent electrical circuits, one, which we will call the X circuit, for the purpose of occupying the applicant's attention; the other, which we will call the Y circuit, is used to distract the subject. The X circuit consists of the following parts: two foot pedals, one hand switch, and two panels of lights, all in series. The lights on the two panels are in parallel, one panel being mounted on the table and the other outside the dark room on the experimenter's controlling board. The two pedals are controlled by the subject's feet while the hand switch is placed to the left of the panel containing the lights. In order to light the eight electric light bulbs the subject must place his two feet upon the foot pedals and bear down with his left hand on the switch while with his right hand he makes the appropriate connections on the panel, the process being very similar to that used on an ordinary telephone switch board.

The Y circuit consists of a bakelite board mounted

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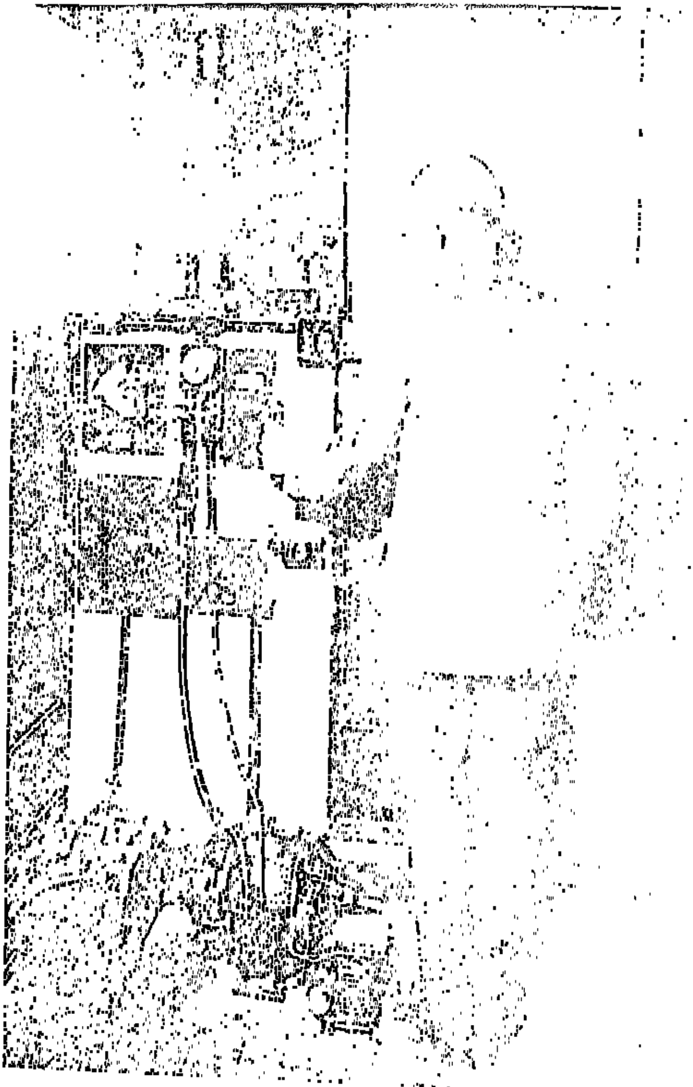
[4] For original test see *Ibid.*, pp. 535-530.

Our first idea, for this test, was found impracticable because of the large expense involved in the construction of the apparatus.

The idea was to have the prospective pilot demonstrate his ability to control a rapidly moving car. This "car" (seat and control) was to be suspended from a horizontal rail. The rail was to be inclined to a degree which would permit the "car" to develop a high rate of speed by means of gravity. In the construction of the support of the car there would be devised an automatic release which would, at a given moment, drop the "car" and the subject several feet. The attention of the subject would be controlled as well as his hands and feet. The subject would be instructed to stop his "car" at a given signal. The operation of the "car" as well as the controlling devices was to be automatic.

EMOTIONAL STABILITY TEST; APPLICANT IN PROPER POSITION

The two bulbs at either end of the table are not a part of the apparatus for this test. They are used in the Multiple Reaction-



CONTROL MECHANISM FOR EMOTIONAL STABILITY TEST
Mr. P. E. Hendricks operating

perpendicularly upon the top of the table and 10 inches in front of the subject's face. On this board are distributed electric wires which act as spark gaps and are controlled by a main switch outside of the dark room. One lead of wire (spark gaps) is extended in such a way that a shock can be administered to the subject's left hand. This Y circuit is in series not only with the main switch but also with two other switches which are in parallel one controlled by the hand and the other by the foot and to the right of the subject. By the use of these last two named switches the subject can at any time intercept the flow of electric current in the Y circuit. The electric power for the Y circuit is transferred by the use of twelve ford coils, a high-frequency transformer (110–25,000 volts, 10 amperes), condenser, tesla coil and rotary spark gap. The reactions of the subject are automatically recorded by the use of a stop watch, which is in parallel with the Y circuit and is controlled by a set of relays and a magnet. The reactions within the body of the subject are recorded by the use of an ohmmeter and galvanometer.

Method. The subject is brought into the dark room and asked to sit in a chair facing the apparatus. He is told to place his two feet upon the two pedals of the X circuit and press down the switch of the same circuit. With his right hand, he is told to operate the small switch board of the X circuit lighting the lights in order, one after the other. To do this the subject must, by a trial and error method, discover successively the terminals which will light the lights in the desired order. He is not only told to do this but he is also shown how to do it and he must *demonstrate* his understanding to the satisfaction of the experimenter. He is also told that if he should fail to light the lights in order (which always happens) he will "blow a fuse" creating a condition made up chiefly of a striking display of flashes of light. He is told that he must eliminate this display, at once, by operating the hand and foot switches found to his right (this, as we have pointed out above, controls the flow of electric current through the Y circuit). Here, as before, the subject is told clearly what to do, the instructions are demonstrated, and he is made to *demonstrate* his understanding to the satisfaction of the experimenter. On the right arm of the subject is mounted a copper plate which terminates in the ohmmeter and galvanometer.

The subject is given to understand that the object of the test is to see how *fast* he can light the lights in the panel of the X circuit. At the same time, however, he is impressively told that if he should see anything unusual happen such as a flash of light or if he should feel a shock, he must shut the current off by operating the two switches to his right (Y circuit). The subject is instructed in semi-darkness, all of the apparatus being hidden from his view but the switches and the panel containing the electric light bulbs that he is to operate. When the test begins he is left in total darkness except for the meager light that comes from the small bulbs which, incidentally, are painted black.

This test consists of two parts:

A. Reaction time during fear: In this part of the test the experimenter permits the subject (after he has been left in the dark room) to light three to five lights and then he administers the shock and the disturbances created by the Y circuit. The subject intercepts the flow of current as rapidly as he can by the use of the two switches to his right. The time that has elapsed during the administration of the disturbance is recorded automatically by a stop watch; and the resistance as well as the change in electrical voltage in the subject's body is recorded on the ohmmeter and galvanometer. The experimenter, by the use of the corresponding panel of lights in the X circuit outside the dark room, is able to check the movements of the subject, who must use his two hands and feet, as instructed, in order to be able to light the bulbs on the panel.

Theory: The theory underlying this part of the test is based upon the analogy drawn from the actual operation of a transportation vehicle. In this test, as in controlling the movements of a vehicle (the pilot's attention being held by the usual operation of the vehicle), the attention of the subject is held by his attempt to light the bulbs as directed. Then, suddenly, an emergency is created which disturbs the pilot—in this case, the subject, emotionally, and to which he must successfully react.

B. Emotional stability: In this part of the test the subject is under the same conditions as in the first part of the test with the exception that he is told to move his feet back on to the two pedals and his hand to the switch controlling the small electric light board (X circuit). He is told also to continue to light the bulbs as rapidly as he can. *During this part of the test the subject is disturbed* four times as in the first part, the difference simply being that the experimenter records very carefully the data supplied by the ohmmeter and galvanometer.[a]

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[a] The results obtained by the use of the galvanometer are not altogether satisfactory because it is very difficult to control the movements of the subject. The results in the first part of the test (fear reaction) do not depend upon the disturbances recorded by the galvanometer but rather the time recorded by the automatically controlled stop watch. The whole problem of measuring emotional stability is a terrifically difficult one. While the use of the galvanometer has not been given up, *experimental work* in the measurement of the heart beat—speed, regularity, and volume has been begun by the use of a plethysomograph and a hydrosphygmograph.

[b] *In as much as it has been a year since this article was submitted for*

Theory: This test is based upon the theory that the record of an emotionally unstable individual will show a greater irregularity, increasing resistance and disturbance in the flow of electric current through his body.

4. *Recklessness.*[6] Apparatus: The apparatus consists of a small board on which are cut four irregular lanes. They vary in length and width, and begin and terminate at two common points. The first lane is the shortest but also the narrowest, the fourth the longest and widest. The lanes contain various obstructions—sharp turns, curves, and irregularities. The lanes are lined with metal strips through which flows the current from an automobile battery. In series with the board is a stylus which can be moved freely through the lanes. However, when it comes in contact with the sides of the lane, the circuit is closed, causing a slight disturbance in the body of the subject. Attached to this circuit is an automatic counter which records the number of times that the subject's stylus comes into contact with the sides of the lane.

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publication, the following changes in procedure have since been made: (1) It has been found better not to use the street analogy. We now simply say, "Move the stylus as rapidly and as carefully as you can through the lane," demonstrating our instructions, explaining that by care we mean "not touching the sides," and pointing to the stop-watch and counter. (2) Now, instead of allowing the subject to traverse the lane of his choice, we ask the subject his choice, record it, but require him to actually traverse the first lane, which is the widest and longest. (3) In place of the kymograph we now use an apparatus (see photograph), specially designed by Gaertner of Chicago, which combines all the recording—tuning fork, seconds, and contacts—on one sensitized tape, it being possible with this apparatus to get a record as much as twenty yards long. (While this apparatus is hidden from the subject's view, in order that the entire apparatus may be included in one picture we have here placed it on the table along side the lanes.)

[6] See *Ibid.*, pp. 541–542 for the description of the apparatus used in the first attempt to measure carelessness.

Underneath the board, containing the lanes, is another board of the same size containing a number of contact points. These points are so distributed that when the subject approaches and passes, with the stylus, any of the points of difficulty found in the lanes,

Recklessness Test; Applicant in Proper Position
Mr. S. Roberts in charge

another electric circuit is completed, resulting in a movement of an electric tambour which registers upon a sensitized paper which is revolving around a kymograph. On the same paper, by the use of another circuit, which operates an electrically maintained tuning fork, is recorded the time in fractions of seconds that it takes the subject to complete the test and also how long it takes him to move the stylus through the points of difficulty.[7]

Method: The subject is told to imagine that these lanes represent the conditions of the streets and that it is his task to move his car, which is now represented by the stylus, through any one of the lanes that he chooses, so that the motion of the stylus which he now guides should terminate at the other end of the lane. He is also told that the object of the test is to see *how rapidly he can move the stylus through the lane*, but that he must be *careful* not to touch the side of the lane as that would count against him. He is given to understand that if his stylus comes in contact with any one of the obstructions of the lane, that that would be parallel, in the analogy, with a collision on the streets. The subject is also told that the time it takes him to complete the movement is recorded by a stop-watch and that the number of "collisions" he has is recorded by the automatic counter.

As a matter of fact, the experimenter is interested only in the judgment which is involved in the selection of the lane that the subject desires to traverse, the data recorded on the kymograph. This part of the recording apparatus is not visible to the subject nor does he know anything about it.

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[7] At first it was thought that it would be best to record the movements of the subject by the use of a pencil instead of a stylus. Instead of the use of the kymograph the record would be traced upon a uniformly moving paper (the motor being controlled by a governor) passing underneath the board containing the lanes. In order to designate upon this record the place where the subject passed through an obstruction a metallic plate would be placed underneath this moving paper. This plate would contain projections corresponding to the points of difficulty, so that when the subject traced the path of the lane with the pencil, an index of his approaching and passing through a point of difficulty would be registered upon the paper. One can easily see that this record would contain the rate of speed with which the subject moves the pencil through the lane.

Theory: The theory underlying this test is that the careful driver will select the lane which permits him to make the best time with the least number or "accidents" and also that he will slow down considerably the movement of the stylus as he approaches and passes any points of difficulty found in his path. Of course the reduced time in passing a difficulty is always proportional to the time with which he moves the stylus between unobstructed points.

MINOR TESTS:

5. *Muscular fatigue.* Apparatus: Telegraph dispatching set and kymograph recorder as used in the recklessness test.

   Method: The subject is told to tap as rapidly as he can upon the key for one minute. The horizontal position of the key is adjustable to such a height that the subject's forearm can rest comfortably on the platform which holds the key.

   Theory: The theory underlying this test can be found in footnote (page 523) of Snow's "Psychology in Business Relations."

6. *Muscular Resistance.* Apparatus. A stiff steel spring mounted horizontally upon a board with a hand grip at the other end. *Alongside this spring is a finely graduated scale.*

   Method: The subject is told to press the spring in a backward motion, exerting his maximum strength.

   Theory: The theory underlying this test is to see if the subject can sustain a great deal of muscular strain. This is obtained by recording the time that elapses from the moment the spring is at the maximum contraction until it has been released one-third of its former distance.

7. *Simple and multiple reaction time.* Apparatus: Hipp's Chronoscope; Stimulus lights, vibrators, bell; Reaction keys and pedals.

Methods: This test has two parts:

A. In the first part the subject is told to react, by pressing a telegraph key, to a light, sound, and touch stimulus, as given by the experimenter. Reaction time is recorded on the chronoscope.

B. In the second part the subject is asked to respond, by the use of pedals and keys, to the various signals which are given by the experimenter, disregarding any other and distracting signals which may be given from time to time. Reaction time is recorded on the chronoscope, and the number of errors is counted.

Theory: The theory underlying the first part of the test is based on the assumption that the subject whose reaction time is slower, and more irregular than the average is a worse "accident risk" than the subject of normal and uniform reaction time. In the second part of the test the subject's reaction time as well as the number of errors made is an index to his ability to pay attention to the safe conduct of his vehicle in spite of the usual distractions of the road.

8. *Perception of space and motion.* Apparatus: Mounted upon a board 20 feet long are two toy vehicles whose motion is controlled by a system of pulleys and weights. Stop watch. Fixed scale of numbers three inches apart along tracks.

Method: The subject stands fifteen feet from the apparatus and facing it. The vehicles are moved at different speeds in various directions, according to eight different, prearranged combinations. The subject is asked at a given signal to indicate at what point the two cars will pass or overtake one another. The experimenter records the error between the subject's estimate and the actual point of passing. Experimenter also records rapidity and regularity of response, speed of learning, and constancy of attention.

Theory: The theory underlying this test is that the subject who is unable, with any degree of accuracy or promptness, to make the necessary judgment suffers from a visual defect—whether central or peripheral—which of course makes the subject an undesirable candidate for a pilot of any transportation vehicle.

Of course it is understood that for each test a learning period has been established. Our standard in giving instructions is to explain them in the *learning period* until the applicant can *demonstrate* to us an understanding of them.

In conclusion the reader is warned against any undue feeling of satisfaction because of the apparent success of the tests. It is too early as yet to tell with absolute certainty whether the problem of the selection of pilots has been adequately solved.

The work at the present moment is hindered by a great number of practical business difficulties, principally labor market. In spite of this, however, the work is very promising and only the future will tell whether it will be lasting or not.

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INTELLIGENCE AND THE HEIGHT-WEIGHT RATIO

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There has always been a certain interest, both popular and scientific, in the question of possible relationships between the physical and the so-called mental traits. One of the most recent and original attacks upon this problem has been made by Naccarati (2), who obtained positive correlations between intelligence scores and two indices of morphologic type: (*a*) the *morphologic index*, an elaborate measure which gives the ratio of length of limb to trunk volume; and (*b*) the *height-weight ratio*, a more simply obtained indication of the same fact. Of the two measures, the morphologic index is the more precise and commonly gives higher correlations with intelligence. The height-weight ratio, however, has the advantage of being easily obtained and the fact that it has given correlations of +0.75 ± 0.05 and +0.70 ± 0.04 with the morphologic index (2) makes it acceptable as a fairly reliable substitute for the latter. Furthermore, it too has given positive correlations with intelligence.

These correlations Naccarati regards as indicative of a relation between intelligence and morphologic type such that the higher levels of intelligence tend to accompany the microsplanchnic type, whereas the lower levels are more likely to appear in the opposite type, the macrosplanchnic. As Naccarati uses the terms, *microsplanchnic* refers to individuals in whom the development of the limbs predominates over the development of the trunk; *macrosplanchnic* to those in whom the development of the trunk is proportionately greater than that of the limbs. Between the two he places the *normosplanchnic* type, which includes individuals in whom the development of limbs and trunk is proportionately balanced. No claim is made for a perfect point for point correspondence between intelligence and morphologic type; in fact, Naccarati believes that neither extreme, morphologically considered, will be found to represent the highest levels of intelligence. His contention is only that, in a group as a whole, a general tendency will be found for greater intellectual activity to be present in individuals in whom the system underlying the activity of the limbs and extremities is dominant over that underlying the visceral and vegetative functions. His explanation of this condition is given in terms of the endocrine glands. He believes that the glands which make for the growth of the longitudinal diameters of the body are the same as those which make for activity of intelligence.

Naccarati's work deserves attention, not only because it represents a novel and promising line of attack upon an old and important problem, but because a considerable body of evidence has been brought forward in support of his theory. In his original publication (2), he presented positive correlations, some of them statistically valid, between scores in standard intelligence tests and his two measures of morphologic type; and in the same study, he reported the absence of significant correlations between intelligence and either height or weight taken separately as evidence supporting his general thesis that a complex activity like intelligence is not connected with a limited feature or aspect of the physical make-up, but with something which, like the glands, exerts a general influence on the organism as a whole. The groups which formed the basis of this study ranged in size from 50 to 221. In a follow-up study, made in collaboration with Lewy-Guinzburg (3), he confirmed the results of the earlier study; positive correlations, some of them substantial, were obtained between the height-weight ratio and the Alpha, Otis, and Thorndike tests. This investigation was based on groups of 50, 94, and 252. In a study made by Naccarati and Garrett (4), "to determine whether there is any relation between body growth and the speed and flexibility of the individual's mental and motor reactions," a comparison of two groups, one having high, the other low morphologic indices, tended to show that "in speed and flexibility of mental and motor performances, as measured by cancellation, controlled association, and maze tracing, those individuals with high morphological indices surpass those with low indices." This conclusion, however, was regarded as tentative because of the size of the group, which included only 57 cases. The same study also brought out positive correlations between the height weight ratio and the Alpha, maze tracing, cancellation, and controlled association tests in groups of 50, 57 and 150. The general tendency of the evidence is to support the contention that there is an appreciable relationship between morphological type and intelligence.

The question of a possible relation between morphologic type and emotional reaction has also been investigated. Naccarati and Garrett, carrying their investigation into the field of temperament (5), found that individuals with low morphologic indices tend to be less stable emotionally than those with high morphologic indices, when emotional stability is measured by the Woodworth questionnaire. This result, too, they considered tentative, because of the size of the sample, which included 54 cases altogether and which was divided into three groups of 18, 16, and 20, representing high, medium, and low emotional stability respectively. In another study made by Naccarati (6), in which 100 psychoneurotics were used as subjects, it was discovered that the "asthenic" patients were more likely to be found among the microsplanchnics, the "emotional" among the macrosplanchnics. Landis, Gullette and Jacobsen (1), however, obtained results exactly the opposite of those of Naccarati and Garrett as regards emotional stability. They found negative correlations, averaging about −0.18, between the height-weight ratio and various criteria of emotionality, but because their group included only 25 cases, they did not attach great significance to this finding. On the whole, the trend of the evidence reported up to this time suggests that the morphologic index is a measure of a fairly definite condition which is connected with intellectual and emotional reactions in a manner which represents something more than chance.

In view of the uniformity with which Naccarati's results have been confirmed, it seems desirable to report a study in which the relation of intelligence to the height-weight ratio was tried out on a somewhat larger scale than that attempted in any of the studies which have appeared so far, and in which the general result has been a failure to obtain any evidence in support of Naccarati's conclusions.

The study in question was made at the University of Minnesota on 1000 native-born white students who entered the College of Science, Literature and the Arts in September, 1924. The selection within the class of entering freshmen, which numbered 1300, was purely alphabetical; the first 500 men and the first 500 women for whom both intelligence scores and measurements of height and weight had been obtained were used as the basis of the study.[1] It is important to note that the 1000 cases studied represented a large sampling of the entire group of 1300.

Height and weight measurements for the women were obtained from the Physical Education Department of the University and those for the men from the University Health Service. These measurements were made as a part of the general physical examination which is given by the members of these departments to all students entering the university. That is, the measurements were made by individuals who had received special training in that line and who had access to apparatus which gave precise and accurate results.

The intelligence scores were those secured in the regular University of Minnesota Entrance Examination which all students take as a part of the entrance routine. This examination is a group test consisting of five parts:

1. H. T. Moore's Completion Test.
2. An Arithmetical Reasoning Test, adapted from the Alpha Test.

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[1] The writer wishes to thank Dr. J. Anna Norris, of the Physical Education Department, Dr. H. S. Diehl, of the University Health Service, and Prof. D. G. Paterson of the Psychology Department for access to the files from which the original data for this study were obtained.

3. An Opposites Test of the multiple choice type, prepared by the *Psychology Department* of the University of Minnesota.
4. A Reasoning Test, taken from the Psychological Examination published by the American Council on Education.
5. A Vocabulary Test, also of the multiple choice type and also prepared by the Psychology Department of the University of Minnesota.

A separate score is given for each test and a final score is determined for the test as a whole. In each component test, the raw scores are converted into percentile ranks which constitute the scores for that test. The final scores are obtained by averaging the percentile scores made by each individual in the five tests and redistributing these averages according to a percentile ranking.

In the present study, correlations were obtained between the height-weight ratio and the percentile scores in each of the five component tests and in the examination as a whole. All correlations were computed according to Pearson's product moment formula.

The reasons for considering this material particularly suitable as a means of testing Naccarati's conclusions are mainly three:

First, the subjects constituted a group considerably larger than any that Naccarati found available. On the whole, Naccarati's groups have been fairly small. The largest group in his original study numbered 221; in his work with Lewy-Guinzburg, his largest group included 252 subjects; and in his two studies with Garrett, his main groups were admittedly small, numbering 57 and 54 respectively, though a supplementary group of 150 was used as the basis of some of the correlations. Furthermore, his highest correlations have not been obtained in the largest groups. The correlations of +0.35 ± 0.06 between the Thorndike test and the morphologic index (2) was obtained from a group of 75; the correlations of +0.44 ± 0.07, +0.37 ± 0.08 and +0.31 ± 0.08 between morphologic type and controlled association, maze tracing, and Alpha respectively (4) were all obtained from groups of 57. The correlations of +0.44 ± 0.06 between Alpha and the height-weight ratio (3) was based on a group of 50. In the larger groups, the correlations were lower. The group of 221 gave a correlation of +0.23 ± 0.04 between the Thorndike test and the height-weight ratio (2), and a correlation of +0.13 ± 0.04 between the same measures was found in the group of 252 (3).

Second, the group used in the present study was presumably less selected on the basis of intelligence. The term "entrance examination" as applied to the Minnesota test is a misnomer if it implies that students are excluded on the basis of low scores. As a matter of fact, all applicants for entrance who are graduates of accredited high schools are admitted; the tests are given as a means of securing information which may be useful in administrative and personnel work. In other words, the lower end of the distribution is present in the freshman class and is represented in the group studied. Naccarati's groups were for the most part students at Columbia University, where the lower end of the distribution is excluded on the basis of entrance examination scores. In fact, Naccarati and Garrett report of one of their groups (5) that the average Alpha score was 170 and that only two of the 54 cases fell into the B group. At the University of Minnesota (7), the median Alpha score for freshmen women was 128; for freshmen men, 129; only 79.9 per cent of the men and 78.8 per cent of the women received A and B grades. This means that approximately 20 per cent of the entering students receive grades of C or lower. These results were obtained in 1918, but the results of intelligence tests given to successive freshmen classes from that year on, have given no indication of a change in the entering students as regards intelligence. On the other hand, there is no reason for believing that the upper end of the distribution is not represented at the University of Minnesota. The results of standard intelligence tests, given in various classes, include some very high scores as well as some relatively low ones. For example, Alpha scores of 200 and over occur with expected frequency. Unfortunately, direct comparisons of the experimental groups in question cannot be made because of differences in the tests employed, but the chances are that the groups used in the present study represent a wider range of intelligence than those used by Naccarati.

Third, the number of subjects made it possible to divide the group on the basis of sex and still have a large number of cases in each group. Several of Naccarati's groups include both men and women. However, where morphological type is concerned and where glandular factors may be involved, it is obvious that sex differences may be important. In fact, a sex difference in the height-weight ratio is indicated by the results of the present study. Specifically the results are as shown in table 1. That is, the women were distinctly higher in height-weight ratio than the men; the difference between the averages of the groups is 19.4 times the P.E. of the difference. To include the two sexes in the same group, therefore, might easily obscure an existing relation. Besides, a division of the group on the basis of sex might bring out sex differences which would not appear if the single group were taken as a whole.

TABLE 1

	AVERAGE H/W RATIO	P.E.$_{av.}$	DIFF.	P.E.$_{diff}$
Men	0.49015	0.00158		
Women	0.54310	0.00184	0.04695	0.00119

The principal statistical results of the study are given in table 2.

There is a marked discrepancy between these results and those obtained in the previously reported studies. The correlations tend to approximate zero and the probable errors are small as compared with those given in the other investigations. In other words, there is nothing in the evidence to indicate a significant relationship between intelligence and the height-weight ratio.

It should be noted, too, that a failure to confirm Naccarati's results occurs both in final scores and in scores for the component tests. If only the final score failed to indicate a significant relationship, the result might be attributed to some failure in this score to represent adequately the subject's performance,—possibly to an improper weighting of the component tests, or the inclusion of one or more poor tests which tended to reduce the distribution to a chance arrangement. But the separate test scores and the final scores give consistent results. This, in turn, may simply mean that all the tests are inadequate as measures of intelligence, but this interpretation is improbable, since the tests used in the examination have been rather thoroughly tried out at Minnesota, and some of them elsewhere, and have been found satisfactory according to accepted standards. It is particularly interesting to note that some of the tests in the group,—the opposites test and the vocabulary test,—are similar to the controlled association tests which Naccarati and Garrett (4) found to give a correlation of +0.44 ± 0.07 with morphologic type, and that the arithmetical reasoning test was adapted from a similar test in the Alpha examination, which gave positive correlations with the height-weight ratio in several of the reported studies (2) (3) (4).

TABLE 2

Correlations between height-weight ratios and percentile scores in the tests indicated

TEST	MEN (500 CASES)		WOMEN (500 CASES)	
	r	$P.E._r$	r	$P.E._r$
Completion	−0.01	0.03	+0.05	0.03
Arithmetical reasoning	+0.01	0.03	−0.07	0.03
Opposites	+0.02	0.03	+0.06	0.03
Reasoning	+0.03	0.03	+0.04	0.03
Vocabulary	+0.10	0.03	+0.03	0.03
Final score	+0.03	0.03	+0.04	0.03

The failure to confirm Naccarati's results, however, does not mean that his conclusions have been disproved. Correlations approximating zero may be brought about by other factors than a chance relationship between the measures in question. Several possibilities must be considered.

First, the correlation may be reduced because the measures themselves are not precise. It is improbable, however, that this condition is an important factor in the present situation.

The estimated reliability of the final score in the entrance test is about .90. This estimate is based on a study of the tests, covering a period of four years, with freshman classes entering the university three times a year. High reliability is indicated by the uniformity of the results obtained from year to year (*a*) in correlations between final scores and scholarship, (*b*) in correlations between these tests and other intelligence tests, and (*c*) in intercorrelations between the component tests. Judged by similar standards, the coefficients of reliability of the component tests,—with the exception of the Reasoning test,—would not fall below .80, and probably only one, the Arithmetical Reasoning test, would fall as low as that. An exception is made of the Reasoning test because it was used for the first time in 1924 and has not been studied as have the others. The physical measures, too, doubtless possess high reliability as measures of height and weight, but perhaps it is well to call attention to the previously stated fact that the reliability of the height-weight ratio as a substitute for the morphologic index is indicated by its correlations of +0.70 and +0.75 with that measure. In his original study, Naccarati makes much of the precision with which the anthropometric measures used in computing the morphologic index must be taken. But in comparison with taking these measures, the determining of an individual's height and weight is a relatively simple matter. Besides, as has been pointed out before, these measurements were taken by persons with special training and in circumstances which would give greater accuracy than is found in most height and weight measurements.

Second, the correlation may be reduced because the group is selected. It is undoubtedly true that this group, like any university group, is selected on the basis of intelligence. Reasons have been given, however, to show that it is probably less selected than those used by Naccarati,—at least, that it is unlikely that it is more selected. But another factor of selection may be found in the morphologic type represented. In fact, Naccarati suggests that his groups are selected on that basis,—that there are no macrosplanchnics among his subjects;

that the tendency is toward the microsplanchnic type, and that, on the whole, his groups include "too many normosplanchnics." He believes that higher correlations with intelligence would be found if his groups were less selected in this respect. Whether the Minnesota group is more selected in morphologic type than Naccarati's may be indicated by comparing the groups in range, where the necessary data are available. Naccarati gives the range of two of his larger groups, which compare with those used in the present study as shown in table 3. Though the range is a rather unsatisfactory measure, it is the only one available, and it serves to indicate at least that the groups used in the present study are not less inclusive than those used by Naccarati.

TABLE 3

GROUPS	NUMBER OF CASES	RANGE IN H/W RATIO
In "The Morphologic Aspects of Intelligence" (men and women)......	221	0.370 – 0.639
In "Hormones and Intelligence" (men).	252	0.321 – 0.640
In the present study (men)....	500	0.318 – 0.706
In the present study (women)..... .	500	0.332 – 0.772

Third, the correlation may be reduced because a common factor, though present, is offset by another factor working in the opposite direction, or hidden by a group of factors working in such a way that the influence of no one of them can be singled out. For example, in a study of the present sort, the sex factor might obscure the relationship between the two measures studied. If there were an existing relation between intelligence and the height-weight ratio in each sex, and if there were a large and significant difference between the sexes in one of these respects, as is actually the case with the height-weight ratio, the combining of the two groups and the application of the same standard to both might confuse the relation of the measures in question to such an extent that an existing relation would be concealed. However, this cause of confusion has been eliminated from the present study. Besides, an examination of the data has failed to reveal indications of other factors which might operate in this way. But it must be recognized that this may only mean that the factors are so involved and intricate that the isolation of any one of them is impossible in the present conditions.

In conclusion, therefore, it can only be said that the present study has failed to bring out any evidence in support of Naccarati's conclusions,—not that his theory has been disproved. The number of cases, however, entitles the results to consideration as a negative instance. It is significant, too, that the conditions in which they were obtained were relatively favorable for this kind of study. The slighter degree of selection within the groups, as compared with those used in the other studies, the probable reliability of the tests, the isolation of the sex factor, and the absence of indications of other complicating factors, make it desirable to report results, which, in the conditions stated, differ from those hitherto obtained in studies of the same problem.

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A STUDY OF CERTAIN ASPECTS OF ADVERTISING IN THE SATURDAY EVENING POST

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This study includes the results of the investigation of several aspects of advertising in the *Saturday Evening Post*, as indicated by the headings of the three following sections, covering the period since 1900. The data were gathered on each topic from complete issues of the months of March, June, September, and December for the years 1900, 1905, 1910, 1915 and 1920, these months being taken as fairly representative of the advertising practice of the year. The advertisements appearing on the front and back covers were omitted from computation throughout the study.

I. INCREASE IN SIZE OF ADVERTISEMENTS, AND IN THE RATIO OF ADVERTISING TO READING SPACE

The data covering both points are given in table 1 in terms of percentages, and need little comment.

The average size, as given in the next to the last column, was found by dividing the total number of pages of advertisements for the year by the total number of individual advertisements of every size for the year. The percentages of the last column were obtained by comparing the amount of space given to advertisements with the total amount of space in the magazine, thus giving the advertising space ratio.

The steady increase in the use of the full-page advertisement is probably the most significant tendency indicated in the table. The double page spread shows a noteworthy jump in 1920, while the half-page size seems to be holding its own. The smaller sizes are fast being eliminated from the *Post*, although they held a relatively important place even as late as 1910 and 1915. The recent development in the use of the double-page spread and the full-page size are largely accountable, no doubt, for the very large jump in the size of the average advertisement for 1920. The last column shows that the amount of space allotted to advertising is fast gaining over the amount allotted to reading matter. This fact raises the question as to the normal saturation point in magazine advertising which ought to be giving both publisher and advertiser some concern.

TABLE 1

Showing increase in size of advertisements and ratio of advertising to reading space

YEAR	DOUBLE-PAGE SPREAD	FULL PAGE	¾ PAGE	½ PAGE	⅓ PAGE	¼ PAGE	⅛ PAGE	1 TO 5 INCHES	AVERAGE SIZE	ADVERTISING SPACE RATIO
	per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*		*per cent*
1900	0	7.2	0	0.5	3.6	22.6	18.8	41.3	0.04	12.0
1905	1.0	17.1	0	2.4	2.8	27.6	15.7	33.4	0.10	37.1
1910	9.3	33.3	0.4	12.3	1.0	21.0	7.7	15.0	0.20	49.5
1915	9.2	41.7	0.3	13.3	2.4	10.3	5.0	5.2	0.19	49.0
1920	22.6	62.0	0	10.2	0	4.6	0.1	0.5	0.81	59.5

II. THE DEVELOPMENT IN THE USE OF ART-FORMS

This study may be considered an extension of the investigation of Kitson[1] to a new type of medium, the *Post*. The same classification as that employed by Kitson was used in the present case so that the data are directly comparable. The results are given in percentages in table 2.

The results show a marked and consistent decrease in the use of pen and ink drawings from about 64 per cent in 1900 to under 11 per cent in 1920. The drift from this type of illustration seems to have been not to any other pure type, but to various forms of combination drawings as indicated by the consistent increase of the latter at a rate roughly comparable to the decrease in the use of the pen and ink type. The wash drawing shows little gain since 1905. The photo follows no consistent trend during the period. The pencil and charcoal types have never been used extensively since 1900. The increase in the use of a combination type may be explained very largely by the relatively enormous development in recent years in the use of color in magazine advertising.

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[1] Jour. App. Psychol., March, 1922, 59.

TABLE 2

Showing tendencies in the use of art-forms in advertisements

YEAR	PENCIL	PEN AND INK	WASH	PHOTO	COMBINATION	CHARCOAL
	per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
1900	2.0	63.9	6.4	24.7	3.0	0
1905	0.3	36.0	30.9	15.1	16.8	0.9
1910	0.4	24.9	30.7	20.6	23.2	0.2
1915	1.2	15.1	25.0	26.3	31.5	0.0
1920	0.5	10.6	37.4	14.1	37.2	0.2

III. THE USE OF THE COUPON OF FULL-PAGE ADVERTISEMENTS

The data concerning the use of the coupon on the full page size is restricted to the years 1910, 1915 and 1920. In the issues selected for study, only 2 full page advertisements were found for 1900, and neither of these bore a coupon. In the issues for 1910 only 7 full page advertisements appeared, 2 of which carried coupons. These will be ignored in the comparisons that follow, which will be based on the other three years above mentioned.

There has been a marked decrease in the use of the coupon on advertisements of this size since 1910. For that year 23.6 per cent of this size contained coupons. This ratio was reduced to 9 per cent in 1915 and to 3.8 in 1920. Evidently the coupon is falling into disrepute among advertisers of the *Post* of the better class.

There appeared to be no trend over the period studied so far as size of coupon is concerned, and therefore the detailed data secured on the area of each coupon are not given. Likewise the form of the coupon has undergone no decided change since 1910, the trangular shape being then, as now, the preferred one, with the rectangle a second choice.

Of the 119 coupons examined for the years 1910, 1915, and 1920 by far the larger number were located in the lower right right hand corner of the page, the corner in such cases being nearly always the loose outside one which permitted the coupon to be easily torn off. To be exact, 96 of the 119 held this position, 13 held the lower left hand corner position, also usually an outside corner. The remaining 10 were located at various points in the layout not easily described.

The length of the signature line was found to vary widely. Only 2 of the 119 examined were less than 1 inch, 46 were between 1 and 2 inches in length, 51 between 2 and 3 inches, and the remaining 20 between 3 and 4 inches. No significant difference appeared for any of the years studied.

The width of the signature space also varied widely as shown by the following distribution of the 119 cases:

Width of space..........	1/8	3/16	1/4	5/16	3/8	7/16	1/2
Number of cases.........	21	7	44	35	9	2	1

No tendency toward the use of a space of greater or less width appeared over the period.

The following table indicates the classes of products advertised in the full page size carrying a coupon:

Automobile and accessories	25
Toilet articles	14
Food products	14
Electric devices for home	10
Floor wax, varnish etc.	10
Home study courses	9
Musical instruments	7
Machinery	7
Office fixtures and supplies	6
Miscellaneous	17

Apparently the coupon is used in advertising smaller, cheaper articles, samples of which may be readily sent, or as a lead to direct mail advertising in connection with more important products.

THE SUITABILITY OF THE DOWNEY GROUP WILL-TEMPERAMENT TEST AS A TEST FOR CHILDREN

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The criticisms of the suitability of using the Downey Group Will-Temperament Test as a test for children of grammar school grades are an outgrowth of a study of racial differences based upon this test. Two hundred and eleven white and negro boys of the seventh and eighth grades of P. S. 119, Manhattan, New York City, were used as subjects. In addition to the test results, the writer secured the chronological ages and the I.Q.'s of the children. The results of white group only, which consisted of 110 children, will be discussed in this paper.

The average age and I.Q. scores, together with the standard deviation and the probable error of the average, are given in table 1.

Space will not permit of a complete discussion of the test. It will be sufficient, however, to recall that it consists of 12 different tests, based mostly on handwriting. Dr. Downey's book, "The Will-Temperament and Its Testing," or the Manual of Directions for the Group Will-Temperament Test, both published by the World Book Company, give a detailed analysis and description of the test. It must suffice here to merely enumerate the parts.

A. Speed of Movement, VI-1
B. Freedom from Load, VI-1, 2
C. Flexibility, VIII
D. Speed of Decision, I
E. Motor Impulsion, X
F. Self-Confidence, XI
G. Non-Compliance, XII

H. *Finality of Judgment*, XIII
I. Motor Inhibition, VII
J. Interest in Detail, IX
K. Coördination of Impulses, V
L. Volitional Perseveration, VIII-2

The writer, on the basis of the test results of the 110 white children, made a careful study of the responses to each test within the total test. The purpose of this careful and detailed study was to determine if the child was reacting to the test as he should in order to measure the trait under consideration.

As a general criticism of the test as a whole, it might be said that the handwriting habits of children are not firmly enough established to warrant the placing of too much dependence upon them. In fact, it is questionable if even the adult has a "usual" style and speed of writing. Great emphasis is placed upon the determination of the subject's normal speed as a standard on which to judge other traits. But, most people have different styles which are normal for the different things that they are writing, i.e., they have a style and speed which is usually used for letter writing, another for note taking, another for writing notices, etc. The child, it is true, has not so many different opportunities to use different styles, but then too, his writing habits are not nearly so firmly established. In addition to this criticism, it may be added that the mental set established through previous contact with mental tests is one of speeding up to accomplish the most possible within a period of time. This mental set strongly militates against the possibility or probability of the child's writing in his usual school manner.

TABLE 1
Age and I.Q. scores

	AGES	I.Q. SCORES
Average	13.22	107 45
σ	1.03	18 85
P.E.	0.07	1.21

A careful analysis of the individual tests within the whole has brought out the following points of criticisms in each.

A. Speed of Movement, VI-1, as determined by the number of letters written at normal speed within the time limit. The mental set of a test situation seemed to be especially operative here with the result that the children as a whole seemed to be trying to write as much as possible within the allotted time. This was evidenced by the lack of perfection in the writing as compared with the writing of the name, age, grade, etc., on the fly-leaf of the booklet. Moreover, while the average number of letters formed during the 20-second period was only 45.50, or $2\frac{1}{2}$ per second, the range was from 21 to 168, showing undoubtably that some of the children were speeding up with the idea that the more they accomplished, the higher would be their score.

B. Freedom from Load, VI-1, 2. This is measured by finding the ratio between the number of letters written at normal speed and when writing as rapidly as one can. If a child had not given a specimen of his normal writing in the first part of the test, the ratio would then not be accurate and the results thus invalidated.

C. Flexibility, VIII. In the first part of the test, the subject is instructed to change his handwriting as much as possible so that no one would recognize it, and is judged by the amount of change. In the second part, he is told to imitate some handwriting as rapidly as possible, and the score is determined by the amount of change and the number of letters written in the given time. Children seemed to like this test very much, and they worked hard on it, especially the first part. But, the scoring offered many problems. What is the child's *normal* style? A study of the writing on the fly leaf, tests II and VI varied so greatly that it was almost impossible to obtain a standard. Also, the judgment based upon these records would as a result be so uncertain as to be little more than personal opinion. Copying the handwriting given in the second part of the test produced nothing of value. As a rule, the first two or three letters were well copied, but then the subject reverted to his own style in an attempt to complete more work. In addition to this, the lack of complete control in writing made it impossible for the child to imitate so difficult a model as the one given. Although this proved to be one of the most interesting tests to the child, the results are worthless as far as an objective measurement of the trait of flexibility is concerned.

D. Speed of Decision, I. This trait is measured by the number of adjectives characterizing the individual which he marks in the given time. The results of this test seem to indicate that most of the children are not reacting to this test in exactly the way Dr. Downey meant them to react. They are making decisions in regard to the pairs of character traits listed, it is true, but their reactions suggest that they are checking the traits which are socially desirable rather than the ones which describe them. In giving the instructions, the examiner laid special emphasis on the point that the child must decide which word best described him, and not which he thought the best of the two. They were also told to draw a line through any pair of words in which one or both words were unfamiliar to them, so that the examiner might know if they actually spent time on the words or merely skipped over them. The average number of traits checked was 26.26 out of a possible 30. Eighty of the 110 completed the entire list. The average time taken, then, to make each decision was 1.71 seconds. Another criticism of this test, based on the fact that such a high percentage of the children completed it in the time interval is that the test is either too short or the time should be shortened. As it is, we have no means of determining if the children complete the test just as the "stop" signal is given, or if they have completed it sometime before. In such a case, their true rate of decision may not be determined, due to the inadequacy of the test material.

The traits were then analyzed according to a standard of what the child would be apt to be taught to believe socially undesirable. This standard, made from an average of judgments given by 5 graduate students in psychology, is as follows: Careless, daring, unambitious, selfish, tardy, bad-tempered, inaccurate, lazy, vain, changeable, indifferent, yielding, distrustful, cowardly, stupid, bad memory, self-distrustful, hasty, unobservant, unsociable, disorderly, gloomy, impatient, slow in thought, slow in movement, holds a grudge, fond of a fight, extravagant, proud, and stingy. Of the 2889 responses given to these pairs of traits, only 259 or on an average of 2.35 per student, were undesirable, according to this standard. The two traits of an undesirable nature most frequently marked were "daring" and "proud." These are ones which we would expect young boys to consider desirable, regardless of their past training in connection with the matter. The ones, on the other hand, which undoubtedly characterized them in many instances, namely, selfish, lazy, stupid, slow in thought, etc., received the smallest number of responses. These results thus help to corroborate the criticism that the children are marking the traits which they have been taught to believe socially desirable rather than the ones which actually characterize them.

Introspection, even for adults with a certain amount of psychological training, is difficult, and we cannot for that reason expect the child to analyze these traits and know which best describes him. The best judgment which he would have of them is the one based on what his parents or teachers had told him, rather than based on his own personal opinion.

E. Motor Impulsion, X, is subject to the same criticisms as the tests for speed of movement and freedom of load. This test is based upon the amount of change which takes place when writing is carried on during certain distracting conditions, as writing with the eyes closed, counting out loud the number of taps made by the examiner, and counting to himself the number of times the examiner says "fly" in a series of words. All of these must be done while the child is writing, and his score depends upon the amount of change occurring in the writing, and the diminution in quantity. The first difficulty was in getting the actual standard from which to judge the changes. The second arose in connection with the child. His handwriting in most cases is not automatic enough to permit him to do two things at once, with the result that many of the children paid attention to the examiner and neglected the writing, while the others concentrated on the writing and ignored what the examiner was saying or doing.

F. Self-Confidence, XI. This trait was measured by the number of statements underlined in the Memory Test. It proved to be a fairly good test, as with only a few exceptions, every child underlined at least one of the statements indicating that he understood what was desired. Contrary to the general expectation, the children did not test so high on this test as one might expect. They made only an average score of 6.84 out of a possible 16. It seems, however, to test the trait sought, and if norms were established for children, it would doubtless prove to be a very good test for them.

G. Non-compliance, XII, was scored on the number of changes made in the Memory Test after the examiner suggests that 8 of the statements are false and 8 true. (This suggestion is untrue, as all of the statements are true.) This test proved to be a rather poor one for children, because, due to the influence of prestige, resulting from the attitude of always accepting without question what a teacher or school authority says, some of the children showed a decided tendency to make changes necessary to comply with this statement. The exact following of the instructions as to how to make the changes, seemed to cause some confusion as was evidenced by the fact that in some cases both True and False were doubly underlined, or each had a circle drawn around it, which was the sign used to indicate that a change had been made. Others, on the other hand, had more than 8 marked true to begin with, and then changed the scoring so that only a few remained. It thus seemed that they were testing out the veracity of the statements rather than complying with the suggestion.

H. Finality of Judgment, XIII, was measured by the number of seconds taken to re-check the traits marked in Test 1. This proved to be a very good test for children and seemed to offer no difficulties in understanding on the part of the children, or in scoring on the part of the examiner.

I. Motor Inhibition, VII. This trait was measured by the number of scrolls traced by the subject in a given period of time. The fewer marked, the higher the subject ranks in the ability to inhibit his motor powers. Three trials are given, but only the third is counted in the final score. The first and second parts contained 66 units of scroll with a time limit of thirty seconds and one minute, thirty seconds respectively. The third had 99 units of scroll and a time limit of two minutes, thirty seconds. For children, this test proved to be very poor because the material given was not enough to permit the ability to be completely tested. So many of the children completed the scrolls that it at once brought up the question of whether they had not perhaps finished it at some time or other before the "stop" signal was given, and thus their ability was not completely tested. Twenty-two per cent of the children completed the scrolls on the first attempt, 38 per cent on the second, and 43 per cent on the third. In addition to this criticism another, relating to the factor of interest, might be added. The children showed obvious signs of boredom by the time that the third trial was given, and this factor doubtless militated against the success and the final mark.

J. Interest in Detail, IX, was measured by copying two difficult bits of handwriting. This test proved to be extremely interesting to the children and they seemed to try hard to do their best on it, but the outcome, in a large majority of the cases, was very unsuccessful. The writing habits of the child, as we have stressed so many times before, are not firmly enough fixed to permit accurate copying of such difficult writing. In many instances, the writing was little changed from the subjects own handwriting, while in other cases, the writing was definitely changed but did not resemble the model. The first letter or so of each attempt quite often bore a close resemblance to the original, but after that, there was a decided tendency for the child to lapse into his own style.

K. Coördination of Impulses, V, was indicated by the number of letters of the phrase, "The United States of America," that the subject could write rapidly on a line 1¼ inches long in seven seconds. This on the whole brought about poor results.

Some few of the children were able to restrain their writing enough to permit the placing of all of the letters on the line. Others, however, had great difficulty and seemed to concentrate their efforts on writing as quickly as possible rather than trying to keep the letters on the line. The average number of letters kept within the given space was 14.03, which, according to the standards given by Dr. Downey, would place it in the third percentile ranking.

L. Volitional Perseveration, VIII, was measured by the time that the subject gives to the practice of disguising his handwriting. This proved to be a very good test for children and they seemed to thoroughly enjoy trying to develop a new style in writing which no one would recognize as theirs. There was a fairly wide distribution of scores with an average of 2.99 minutes spent in this practice.

These comments, on the test in general and on each test in particular, point out some of the good and bad features of the Downey Group Will-Temperament Test as a test for children in the highest grades of the elementary school. It would seem to be a test better suited for subjects of a more sophisticated type, as high school or college students. They would understand better what they are meant to do in each case, and would also have the motor facility for doing this. If the group test is to be given to children at all, it seems that it would be better to give it individually, so that the examiner could explain the instructions more thoroughly to the individual children, and so that the time might be checked up more accurately. Any slight discrepancy in starting or stopping time would so invalidate the results as to give a false picture of the trait measured. In this test, more than in Intelligence Tests where the time allotted to each part of the test is much longer, and runs up into the minutes, rather than being limited sometimes even to a fraction of a minute, it is absolutely essential that all signals be obeyed to the dot. This is difficult with adults, but is almost impossible with children unless the examiner is assisted by a large corps of monitors.

ON THE IDENTIFICATION OF CERTAIN SPOKEN WORDS BY THEIR TACTUAL QUALITIES

ROBERT H. GAULT[1, 2]

Northwestern University

In other publications[3] I have described the method of my experiments on Tactual Interpretation of Speech, etc., the nature of the stimuli that have been employed in drill and I have set forth some data relating to the course of learning in this relation. It has been demonstrated beyond doubt that the sounds of speech may be communicated as vibrations by a suitable instrument to the fingers of a totally deaf subject so that he can feel them and learn to know their meanings as we learn the significance of auditory stimuli.

Our subjects have had a great amount of drill upon the tactual correlates of each one of a given list of words and upon certain vowel and diphthongal qualities and vowel-consonant combinations.

Is there any profit in it all that can be shown in the subjects' ability to understand new words by their tactual qualities alone? By "new words" I mean combinations that *as words* had never been felt before but the vowel and other elements of which had many times been upon their fingers.

The responsibility for an answer must be put upon the laboratory. Accordingly on November 30, 1925 we wrote the

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[1] On leave with the National Research Council.

[2] I am indebted to President Hall of Gallaudet College for his co-operation in the work I have in hand and to my assistants, Mr George Crane, Miss Masne Lawntsen and Mrs. Helen Austen for their help in many ways.

[3] Jour. Abn. Psy. and Soc. Psy., XIX, No 2, 1924; Sci Mo., XXII, Feb., 1926; Jour. Wash. Acad. Sci., XV, No. 14, 1925; Archives of Oto-Laryngology, Feb., 1926.

names of the days of the week upon the blackboard in the presence of our deaf cases. They had never felt one of these words before that day. With the help of the subjects we marked each word to indicate where there are elements and combinations (*er*, for example, as in Saturday) that they had felt already many times. This done, with no other preparation, the experimenter went out of sight into another room, and pronounced the words into the system. Each subject in the reaction room felt his receiver[4] vibrate in unison with every spoken word. There were twenty presentations in a series but they were not in the same order in any two series. The order in the first series was as follows: Wednesday, Saturday, Sunday, Monday, Friday, Monday, Tuesday, Saturday, Thursday, Tuesday, Sunday, Tuesday, Thursday, Sunday, Wednesday, Tuesday, Monday, Saturday, Friday, Saturday.

At the end of each series we checked up the written reports. In the vertical columns below are the names that were identified by each one in turn. The figures at the right of the subjects' names indicate the number of identifications he made out of a possible twenty.

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[4] "I am indebted to the Bell Telephone Laboratories for the instruments I am using in these experiments."—R. H. G.

IDENTIFICATIONS

I CLARK, 11	II AUSTIN, 10	III AUSTIN, 11	IV AUSTIN, 8	V AUSTIN, 13	VI BRAUNAGEL, 7	VII BRAUNAGEL, 10
Tues.	Sat.	Tues.	Mon.	Fri.	Tues.	Tues.
Sat.	Fri.	Sat.	Wed.	Sat.	Sat.	Thurs.
Sat.	Mon.	Fri.	Sat.	Sun.	Wed.	Sat.
Thurs.	Sat.	Sun.	Fri.	Mon.	Mon.	Wed.
Fri.	Thurs.	Thurs.	Mon.	Wed.	Sat.	Mon.
Sun.	Tues.	Sun.	Sat.	Tues.	Sat.	Fri.
Tues.	Wed.	Sat.	Sat.	Thurs.	Mon.	Sat.
Thurs.	Sat.	Fri.	Sat.	Sat.		Tues.
Sat.	Fri.	Sat.		Mon.		Sat.
Fri.	Sat.	Mon.		Sat.		Fri.
Sat.		Tues.		Wed.		Sat.
				Sat.		Tues.
				Thurs.		Wed.
						Thurs.
						Tues.
						Sun.

VIII BRAUNAGEL, 13	IX MARSDEN, 5	X MARSDEN, 6	XI MARSDEN, 12	XII NELSON, 11	XIII NELSON, 16	XIV NELSON, 19
Fri.	Sun.	Sat.	Fri.	Tues.	Tues.	Fri.
Tues.	Tues.	Tues.	Sat.	Sat.	Sat.	Fri.
Sat.	Sat.	Sat.	Mon.	Wed.	Wed.	Tues.
Sun.	Sat.	Tues.	Mon.	Mon.	Mon.	Sat.
Mon.	Tues.	Sat.	Wed.	Fri.	Fri.	Sun.
Wed.		Tues.	Tues.	Sun.	Sat.	Mon.
Tues.			Sat.	Sat.	Tues.	Mon.
Thurs.			Mon.	Wed.	Sat.	Wed.
Sat.			Fri.	Tues.	Fri.	Tues.
Tues.			Sat.	Sun.	Sat.	Thurs.
Fri.			Wed.	Sat.	Mon.	Sat.
Sat.			Sat.	Sat.	Tues.	Tues.
Sat.				Mon.	Wed.	Mon.
				Tues.	Thurs.	Fri.
					Tues.	Sat.
					Sun.	Wed.
						Sun.
						Sat.
						Thurs.
						Tues.

SUBSTITUTIONS OR CONFUSIONS

Following are the substitutions that were made in each of series. In each case the sum of the substitutions and identifications on preceding pages equals twenty.

I. CLARK, 9	II. AUSTIN, 10	III. AUSTIN, 9
Mon. for Sun.	Sun. for Tues.	Mon. for Thurs.
Thurs. for Mon.	Mon. for Sun.	Thurs. for Wed.
Wed. for Mon.	Wed. for Mon.	Wed. for Mon.
Thurs. for Wed.	Tues. for Wed.	Sun. for Mon.
Mon. for Tues.	Sun. for Tues.	Tues. for Sun.
Mon. for Sun.	Mon. for Sun.	Wed. for Sat.
Thurs. for Wed.	Sun. for Thurs.	Thurs. for Tues.
Wed. for Tues.	Mon. for Sun.	Tues. for Wed.
Sun. for Mon.	Fri. for Tues.	Mon. for Tues.
	Sun. for Mon.	

IV. AUSTIN, 12	V. AUSTIN, 7	VI. BRAUNAGEL, 13
Thurs. for Tues.	Mon. for Tues.	Fri. for Thurs.
Tues. for Thurs.	Sun. for Mon.	Thurs. for Fri.
Sun. for Tues.	Sun. for Tues.	Sun. for Mon.
Thurs. for Sun.	Thurs. for Fri.	Fri. for Sun.
Thurs. for Fri.	Tues. for Sun.	Mon. for Tues.
Wed. for Mon.	Wed. for Sun.	Tues. for Wed.
Fri. for Tues.	Fri. for Tues.	Thurs. for Sun.
Thurs. for Wed.		Sun. for Thurs.
Mon. for Sun.		Fri. for Tues.
Mon. for Tues.		Thurs. for Sun.
Tues. for Thurs.		Sun. for Fri.
Fri. for Sun.		Wed. for Sat.
		Sun. for Tues.

VII. BRAUNAGEL, 4	VII. BRAUNAGEL, 7	IX. MARSDEN, 15
Sun. for Mon.	Thurs. for Mon.	Mon. for Tues.
Mon. for Sun.	Sun. for Mon.	Tues. for Thurs.
Sun. for Mon.	Sun. for Wed.	Wed. for Sat.
Mon. for Sun.	Mon. for Sun.	Tues. for Wed.
	Fri. for Thurs.	Sat. for Mon.
	Mon. for Sun.	Mon. for Fri.
	Sun. for Tues.	Fri. for Mon.
		Wed. for Sat.
		Thurs. for Tues.
		Sun. for Wed.
		Thurs. for Sun.
		Mon. for Thurs.
		Fri. for Sun.
		Mon. for Fri.
		Sun. for Mon.

X. MARSDEN, 14		XI. [illegible], 8		XII. NELSON, 6	
Sun.	for Mon.	Sun.	for Tues.	Thurs.	for Fri.
Tues.	for Wed.	Mon.	for Sun.	Mon.	for Sun.
Mon.	for Tues.	Sun.	for Thurs.	Thurs.	for Tues.
Mon.	for Thurs.	Thurs.	for Mon.	Mon.	for Sun.
Mon.	for Fri.	Thurs.	for Sun.	Tues.	for Thurs.
Sun.	for Mon.	Tues.	for Thurs.	Thurs.	for Fri.
Wed.	for Sun.	Mon.	for Sun.		
Tues.	for Fri.	Fri.	for Tues.		
Thurs.	for Mon.				
Wed.	for Sat.				
Sun.	for Wed.				
Mon.	for Sun.				
Fri.	for Thurs.				
Thurs.	for Sun.				

XIII. [illegible], 4		XIV. [illegible], 1	
Fri.	for Thurs.	Mon.	for Sun.
Sun.	for Mon.		
Thurs.	for Sun.		
Mon.	for Sun.		

SUBSTITUTIONS AND THEIR FREQUENCIES

SUNDAY (GIVEN 42 TIMES)	times	MONDAY (GIVEN 42 TIMES)	times
Reported as Monday	17	Reported as Sunday	12
Reported as Tuesday	2	Reported as Tuesday	0
Reported as Wednesday	2	Reported as Wednesday	4
Reported as Thursday	7	Reported as Thursday	3
Reported as Friday	3	Reported as Friday	2
Reported as Saturday	0	Reported as Saturday	1
Total	31	Total	22

TUESDAY (GIVEN 56 TIMES)		WEDNESDAY (GIVEN 28 TIMES)	
Reported as Sunday	7	Reported as Sunday	3
Reported as Monday	7	Reported as Monday	0
Reported as Wednesday	1	Reported as Tuesday	5
Reported as Thursday	3	Reported as Thursday	4
Reported as Friday	5	Reported as Friday	0
Reported as Saturday	0	Reported as Saturday	0
Total	23	Total	12

THURSDAY (GIVEN 28 TIMES)		FRIDAY (GIVEN 28 TIMES)	
Reported as Sunday..........	3	Reported as Sunday..........	1
Reported as Monday..........	1	Reported as Monday..........	3
Reported as Tuesday.........	5	Reported as Tuesday.........	1
Reported as Wednesday.......	0	Reported as Wednesday......	0
Reported as Friday...........	4	Reported as Thursday........	4
Reported as Saturday........	0	Reported as Saturday........	0
Total.....................	13	Total.....................	9

SATURDAY (GIVEN 52 TIMES)

	times
Reported as Sunday.............	0
Reported as Monday............	0
Reported as Tuesday............	0
Reported as Wednesday.........	5
Reported as Thursday	0
Reported as Friday..............	0
Total......................	5

	IDENTIFIED	POSSIBLE	CHANCE
Clark........................	11	20	2$\frac{6}{7}$– 3
Austin.......................	42	80	11$\frac{3}{7}$–12
Braunagel....................	36	60	8$\frac{4}{7}$– 9
Marsden.....................	23	60	8$\frac{4}{7}$– 9
Nelson......................	49	60	8$\frac{4}{7}$– 9
Totals......................	161	280	40 –42

Aggregate of identifications possible for whole group...........	280
Actual number of identifications by whole group................	161
Aggregate of identifications possible for whole group by chance...	40–42

ORDER OF LIABILITY TO MISINTERPRETATION

Saturday..	0.096
Friday...	0.32
Tuesday...	0.41
Wednesday...	0.428
Thursday...	0.5
Monday...	0.523
Sunday..	0.737

SUBSTITUTIONS IN ORDER OF FREQUENCIES

For Sunday:

Monday	15
Thursday	7
Friday	3
Tuesday	2
Wednesday	2

For Monday:

Sunday	11
Wednesday	4
Thursday	4
Friday	1
Saturday	1

For Tuesday:

Monday	7
Sunday	7
Friday	5
Thursday	4
Wednesday	1

For Wednesday:

Tuesday	5
Thursday	4
Sunday	3

For Thursday:

Tuesday	5
Friday	4
Sunday	3
Monday	3

For Friday:

Thursday	5
Monday	3
Sunday	1
Tuesday	1

For Saturday:

Wednesday	5

IDENTIFICATION OF THE NAMES OF THE MONTHS

On November 25, December 1 and 2 we made precisely this test employing the names of the months as stimuli. The preparation for the exercise was exactly what I have described in relation to the names of the days of the week and no more. The words "June" and "May" (the latter as an auxiliary verb) had already occurred many times in drill. The other words were all total strangers. The subject "Hughes" had had no experience in our laboratory prior to December first.

The analysis follows:

I CLARK, 6	II CLARK, 8	III AUSTIN, 13	IV AUSTIN, 16	V AUSTIN, 12
Mar.	Mar.	Mar.	Oct.	Apr.
Nov.	May	Jan.	June	July
Apr.	Jan.	June	Sept.	Oct.
July	Aug.	Oct.	July	Dec.
Aug.	Sept.	Dec.	Jan.	Mar.
Nov.	Feb.	Oct.	Apr.	Aug.
	Mar.	July	Nov.	Aug.
	Nov.	May	Feb.	Feb.
		Aug.	Mar.	Nov.
		Dec.	Oct.	Apr.
		Feb.	July	Mar.
		Jan.	May	Oct.
		July	Aug.	
			Dec.	
			July	
			Feb.	

VI AUSTIN, 13	VII AUSTIN, 15	VIII BRAUNAGEL, 4	IX BRAUNAGEL, 10	X MARSDEN, 9
Oct.	Mar.	June	Mar.	Oct.
Aug.	May	July	May	Apr.
Dec.	Apr.	Feb.	Sept.	Nov.
Mar.	Jan.	Mar.	Mar.	Oct.
Jan.	Oct.		Oct.	May
Apr.	Dec.		April	Aug.
July	Aug.		Aug.	Nov.
May	June		Feb.	Jan.
Mar.	Feb.		Jan.	Feb.
Oct.	May		July	
Aug.	Mar.			
Nov.	Aug.			
May	July			
	Oct.			
	April			

XI MARSDEN, 14	XII MARSDEN, 9	XIII NELSON, 16	XIV NELSON, 17	XV HUGHES, 3
Apr.	Oct.	Dec.	Oct.	Oct.
Oct.	Aug.	Oct.	Aug.	Aug.
Dec.	Dec.	Sept.	Mar.	July
Mar.	Mar.	July	Jan.	
Jan.	Apr.	Jan.	Apr.	
Aug.	May	Apr.	July	
Aug.	Aug.	Nov.	May	
Feb.	Nov.	Feb.	June	
Nov.	May	Mar.	Mar.	
Apr.		July	Oct.	
Mar.		May	Apr.	
July		Aug.	Aug.	
Oct.		Sept.	Feb.	
June		July	Jan.	
		Jan.	Nov.	
		Feb.	May	
			July	

Substitutions

I. CLARK, 14	II. CLARK, 12	III. AUSTIN, 7
June for Feb.	July for Apr.	Jan. for Feb.
Aug. for Jan.	Dec. for Oct.	Dec. for Nov.
Dec. for Sept.	Nov. for Dec.	Feb. for Apr.
July for June	June for July	Mar. for July
Sept. for Oct.	May for June	Feb. for Sept.
Nov. for Dec.	Oct. for Jan.	Jan. for Nov.
Dec. for Oct.	Dec. for Nov.	Nov. for Sept.
June for July	June for May	
April for May	Jan. for Aug.	
Sept. for Dec.	*Blank* for July	
Jan. for Feb.	Sept. for Oct.	
July for Jan.	Jan. for Apr.	
Mar. for July		
Feb. for Sept.		

IV. AUSTIN, 4	V. AUSTIN, 8	VI. AUSTIN, 7
Feb. for Dec.	Nov. for Dec.	Mar. for June
Jan. for Sept.	June for May	Dec. for Sept.
Oct. for Nov.	Feb. for Jan.	Feb. for Apr.
Nov. for Jan.	May for June	Jan. for Feb.
	Sept. for Jan.	Feb. for Jan.
	Dec. for Sept.	Apr. for Nov.
	June for July	Sept. for July
	May for June	

VII. AUSTIN, 5	VIII. BRAUGHAGEL, 16	IX. BRAUGHAGEL, 10
June for July	Nov. for Dec.	Feb. for Oct.
Dec. for Sept.	Apr. for Oct.	Apr. for Aug.
Nov. for Jan.	Jan. for Sept.	Jan. for Dec.
Jan. for Nov.	Sept. for Jan.	July for Jan.
Jan. for Nov.	Aug. for Apr.	Aug. for Apr.
	Dec. for Nov.	June for July
	Dec. for Oct.	Aug. for June
	Aug. for July	Dec. for Nov.
	July for May	Oct. for Nov.
	Apr. for Aug.	June for May
	Nov. for Dec.	
	Oct. for Sept.	
	Sept. for Nov.	
	June for July	
	Apr. for Jan.	
	Jan. for Feb.	

X. MARSDEN, 11	XI. MARSDEN, 6	XII. MARSDEN, 11
Sept. for Dec.	May for July	Feb. for Jan.
Jan. for June	Sept. for Dec.	June for July
Dec. for Sept.	June for May	Mar. for June
Mar. for July	July for June	Oct. for Sept.
July for Jan.	Dec. for Jan.	Nov. for Mar.
Jan. for Feb.	Oct. for Sept.	Dec. for Oct.
June for Mar.		July for Apr.
June for July		Jan. for Feb.
Sept. for Dec.		Feb. for Jan.
Nov. for Sept.		Sept. for Nov.
Feb. for July		Mar. for July

XIII. NELSON, 4	XIV. NELSON, 3	XV. HUGHES, 17
Mar. for June	Sept. for Dec.	May for Mar.
Sept. for Oct.	Nov. for Sept.	June for May
Nov. for Dec.	Sept. for Nov.	Aug. for Apr.
Oct. for Nov.		Sept. for Jan.
		Apr. for Dec.
		Jan. for Aug.
		Dec. for July
		June for Sept.
		Feb. for June
		Jan. for Feb.
		July for Jan.
		Sept. for Nov.
		June for May
		Apr. for Mar.
		Oct. for Nov.
		Feb. for Oct.
		Aug. for Apr.

JANUARY (GIVEN 30 TIMES)	*times*
Reported as Feb	4
Reported as Mar	0
Reported as Apr	1
Reported as May	0
Reported as June	0
Reported as July	4
Reported as Aug	1
Reported as Sept	3
Reported as Oct	1
Reported as Nov	2
Reported as Dec	1
Total	17

FEBRUARY (GIVEN 21 TIMES)	*times*
Reported as Jan	7
Reported as Mar	0
Reported as Apr	0
Reported as May	0
Reported as June	1
Reported as July	0
Reported as Aug	0
Reported as Sept	0
Reported as Oct	0
Reported as Nov	0
Reported as Dec	0
Total	8

MARCH (GIVEN 24 TIMES)	
Reported as Jan	0
Reported as Feb	0
Reported as Apr	1
Reported as May	1
Reported as June	1
Reported as July	0
Reported as Aug	0
Reported as Sept	0
Reported as Oct	0
Reported as Nov	1
Reported as Dec	0
Total	4

APRIL (GIVEN 24 TIMES)	
Reported as Jan	1
Reported as Feb	2
Reported as Mar	0
Reported as May	0
Reported as June	0
Reported as July	2
Reported as Aug	4
Reported as Sept	0
Reported as Oct	0
Reported as Nov	0
Reported as Dec	0
Total	9

MAY (GIVEN 23 TIMES)	
Reported as Jan	0
Reported as Feb	0
Reported as Mar	0
Reported as Apr	1
Reported as June	6
Reported as July	1
Reported as Aug	0
Reported as Sept	0
Reported as Oct	0
Reported as Nov	0
Reported as Dec	0
Total	8

JUNE (GIVEN 18 TIMES)	
Reported as Jan	1
Reported as Feb	1
Reported as Mar	4
Reported as Apr	0
Reported as May	3
Reported July	2
Reported as Aug	1
Reported as Sept	0
Reported as Oct	0
Reported as Nov	0
Reported as Dec	0
Total	12

JULY (GIVEN 36 TIMES)	times
Reported as Jan.	0
Reported as Feb.	1
Reported as Mar.	4
Reported as Apr.	0
Reported as May	1
Reported as June	8
Reported as Aug.	1
Reported as Sept.	1
Reported as Oct.	0
Reported as Nov.	0
Reported as Dec.	1
Total	17

AUGUST (GIVEN 24 TIMES)	times
Reported as Jan.	2
Reported as Feb.	0
Reported as Mar.	0
Reported as Apr.	2
Reported as May	0
Reported as June	0
Reported as July	0
Reported as Sept.	0
Reported as Oct.	0
Reported as Nov.	0
Reported as Dec.	0
Total	4

SEPTEMBER (GIVEN 21 TIMES)	
Reported as Jan.	2
Reported as Feb.	2
Reported as Mar.	0
Reported as Apr.	0
Reported as May	0
Reported as June	1
Reported as July	0
Reported as Aug.	0
Reported as Oct.	3
Reported as Nov.	3
Reported as Dec.	5
Total	16

OCTOBER (GIVEN 30 TIMES)	
Reported as Jan.	0
Reported as Feb.	2
Reported as Mar.	0
Reported as Apr.	1
Reported as May	0
Reported as June	0
Reported as July	0
Reported as Aug.	0
Reported as Sept.	1
Reported as Nov.	0
Reported as Dec.	4
Total	8

NOVEMBER (GIVEN 28 TIMES)	
Reported as Jan.	3
Reported as Feb.	0
Reported as Mar.	0
Reported as Apr.	1
Reported as May	0
Reported as June	0
Reported as July	0
Reported as Aug.	0
Reported as Sept.	4
Reported as Oct.	4
Reported as Dec.	4
Total	16

OCTOBER (GIVEN 30 TIMES)	
Reported as Jan.	1
Reported as Feb.	1
Reported as Mar.	0
Reported as Apr.	1
Reported as May	0
Reported as June	0
Reported as July	0
Reported as Aug.	0
Reported as Sept.	5
Reported as Oct.	0
Reported as Nov.	0
Total	14

FOR JANUARY		FOR FEBRUARY		FOR MARCH		FOR APRIL	
Feb.	4	Jan.	7	Apr.	1	Aug.	4
July	4	June	1	May	1	July	2
Sept.	3			June	1	Feb.	2
Nov.	2			Nov.	1	Jan.	1
Apr.	1						
Aug.	1						
Oct.	1						
Dec.	1						

FOR MAY		FOR JUNE		FOR JULY		FOR AUGUST	
June	6	Mar.	4	June	8	Jan.	2
Apr.	1	May	3	Mar.	4	Apr.	2
July	1	July	2	Feb.	1		
		Jan.	1	May	1		
		Feb.	1	Aug.	1		
		Aug.	1	Sept.	1		
				Dec.	1		

FOR SEPTEMBER		*FOR OCTOBER*		*FOR NOVEMBER*		*FOR DECEMBER*	
Dec.	5	Dec.	4	Sept.	4	Nov.	6
Nov.	3	Feb.	2	Oct.	4	Sept.	5
Oct.	3	Apr.	1	Dec.	4	Jan.	1
Jan.	2	Sept.	1	Jan.	3	Feb.	1
Feb.	2			Apr.	1	Apr.	1
June	1						

	IDENTIFIED	POSSIBLE	CHANCE
Clark	14	40	3⅓
Austin	69	100	8⅓
Braunagel	14	40	3⅓
Marsden	32	60	5
Nelson	33	40	3⅓
Hughes	3	20	1⅔
Totals	165	300	25–27

Aggregate of identifications possible for whole group.......... 300
Actual number of identifications by whole group.............. 165
Aggregate of possible correct guesses by whole group......... 25–27

Order of liability to misinterpretation

March	0.166	July	0.472
August	0.166	January	0.566
October	0.200	November	0.57
May	0.347	December	0.6
April	0.37	June	0.75
February	0.38	September	0.76

Similar experiments have been made in which the names of fruits, animals, birds, cities, states, nations and the like have been employed as stimuli; twenty tests in all. The results are of the same character as the foregoing.

MORAL JUDGMENT IN FEMALE DELINQUENTS

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The current neglect of the question of the influence of moral ideas on delinquency is excusable in view of the difficulty of devising tests of moral judgment. The Brogan Test of Moral Perception offers so much interesting data regarding the moral ideas of normals that the writer took advantage of an opportunity of giving it to a group of 138 female delinquents at the Geneva Reformatory in Nebraska. The major findings of this study point emphatically to certain significant conclusions.

The Brogan "list," it will be recalled,[1] consists of a list of 16 "bad" practices, which were suggested by university students. In employing this list as a test, the subject is required to put them in the order of "badness." This is accomplished by placing the number *one* after the worst practice, and so on. The objection has been made that some subjects might regard certain practices in this list as not "bad" at all. But this circumstance hardly prevents them from arranging them in *the order of their badness. Even indifferent or good practices* differ in the degree of their indifference or goodness. Of course, directions to the subjects should make this matter clear to them. However, the writer conformed closely to the practice of Mr. Brogan in giving this test for the sake of securing comparative results. The subjects were warned to give their own judgments, not what they were supposed to say. Their names were not taken at all. It was explained to them that their identity was effectually concealed in these tests. Unfortu-

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[1] A. P. Brogan. Moral valuations about men and women. International Journal of Ethics, Vol. 35, 105–124.

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TABLE 1

PRACTICES	ORDER OF BADNESS		AVERAGE DEVIATION	
	University women	Reformatory women	University women	Reformatory women
Sex irregularity	1	1	1.06	2.54
Stealing	2	3	2.18	2.23
Cheating	3	9	2.18	3.46
Lying	4	3	2.48	2.66
Drinking	5	4	2.05	2.58
Gambling	6	8	2.44	2.44
Vulgar talk	7	6	2.64	2.42
Sabbath breaking	8	5	3.42	3.65
Swearing	9	7	2.23	2.60
Gossip	10	11	2.07	2.78
Selfishness	11	14	3.14	2.20
Idleness	12	13	3.06	2.74
Snobbishness	13	15	2.38	1.97
Extravagance	14	13	2.38	2.88
Smoking	15	10	1.96	2.73
Dancing	16	16	1.87	2.79
Average deviation			2.52	2.07

As to order of badness, there is remarkable agreement between the two groups. The reformatory women represent drinking, extravagance, lying, Sabbath breaking, smoking, swearing, and vulgar talk as more serious offenses than do the college women. On the other hand, the college women consider cheating, gambling, gossip, idleness, selfishness, snobbishness, and stealing as more serious offenses than do the reformatory cases. Differences are pronounced only as regards cheating. We naturally expect the reformatory women to rank this as a less than average offense, because they are not by training familiar with its evils. Sabbath breaking offers another rather marked difference, but the Brogan list as used among college students shows that this is typically the point of greatest diversity of judgment. On the whole, the reformatory women do seem to show more the influence of traditional Christian morality, which the college women escape, presumably because of the so-called "liberalizing" influence of university life. This does not imply, of course, that this liberalizing influence is not in the right direction. Another result of importance is the fact that the reformatory cases hardly deviate any more from their group averages than do the university women.

nately, the request to show the relation of the offenses of these subjects to their moral evaluations was refused by the officials *of the institution. However, the cases are almost entirely* sex offenders of the "unfortunate mother" type.

The Brogan list is significant because it has been given to thousands of university students, representing good samplings from the United States as a whole; and also because the test has yielded almost the same results, irrespective of place or sex. Table 1 gives a comparison of the reformatory cases and university *women, both as regards order of "badness,"* and deviation from the group average.

GENERAL CONCLUSIONS

1. The delinquency of these cases is not due to the absence of normal moral insight. In this, they are approximately the equals of university women.

2. We must then look for the causes of their deficiency in the emotional, volitional, or intellectual sphere.

3. These cases again show the normality of their moral judgment by the absence of "rationalization." That is, in spite of the fact that most of these 138 cases are sex offenders, *they designate sex offenses as the most serious.*

These conclusions are of course highly tentative. If other more sweeping and adequate studies should confirm these results, it would indicate that moral instruction (*a*) either fails to seriously affect the conduct of man, or else (*b*) that at least the moral instruction of the past has failed to do so.

THE RETURNS FROM FOLLOW-UP LETTERS TO QUESTIONNAIRES

HERBERT A. TOOPS

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The writer has previously pointed out the desirability and possibility of securing practically perfect returns to a questionnaire.[1] In this previous report 93 per cent of returns from 96 former trade school students were secured by the use of five follow-up letters. The writer recently has secured by the use of six follow-up letters 100 per cent of returns from 110 questionnaires, on the use of university intelligence tests,[2] sent

TABLE 1

Cumulative percentage of returns received, by number of follow-up letters sent, in two investigations

NUMBER OF FOLLOW-UP LETTERS SENT	CUMULATIVE PER CENT OF REPLIES RECEIVED	
	Students (former study)	College people (this study)
Initial questionnaire	8	53
1	26	65
2	56	83
3	69	88
4	76	97
5	93	99
6		100
Number of questionnaires received by recipients.....	96	110

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[1] Toops, H. A. Validating the Questionnaire Method. Journal of Personnel Research, vol. 2, nos. 4 and 5, August–September, 1923, pp. 153–169.

[2] To appear shortly.

to college professors and administrative authorities. The cumulative returns from the questionnaires of the two investigations are given in table 1. The follow-up letters used in the second investigation are given in the appendix to this article.

In an effort to determine what factors in the second investigation might underly slow answering, several tables were prepared, a few of which are given below. The twenty-sixth question of the questionnaire was: "Do you wish your answers to be kept confidential?" The relationship of the answers on this question to possession of a reliability coefficient for the test used is given by table 2. An inspection of this table indicates a very slight association between knowing the reliability of their tests and wishing to keep their answers confidential.

TABLE 2

Relationship between willingness to have answers published and possession of a reliability coefficient for tests used

RELIABILITY OF TESTS	WISH ANSWERS KEPT CONFIDENTIAL	DO NOT DESIRE TO HAVE ANSWERS KEPT CONFIDENTIAL	TOTAL
Know reliability of tests used..	5	15	20
Do not know reliability of tests used........................	7	52	59
Total........................	12	67	70

TABLE 3

Relationship between willingness to have answers published and possession of a validity coefficient for tests used

VALIDITY OF TESTS	WISH ANSWERS KEPT CONFIDENTIAL	DO NOT DESIRE TO HAVE ANSWERS KEPT CONFIDENTIAL	TOTAL
Validity of 0.47 or above*......	2	20	22
Validity of 0.46 or below.......	4	20	24
Do not know validity..........	6	27	33
Total........................	12	67	79

* The median validity coefficient was 0.46.

TABLE 4

Relationship between use or non-use of tests, their validity, and number of follow-up letters required to secure a reply

(Experimental use is counted as use in this table)

NUMBER OF FOLLOW-UP LETTERS REQUIRED	NUMBER OF COLLEGES WHICH					GRAND TOTAL
	Do not use tests	Use tests				
	Total	Total	Do not know validity	Validity 0.40 or less	Validity 0.41 or above	
0	15	43	16	15	12	58
1	4	10	5	3	2	14
2	6	13	5	5	3	19
3	1	5	3		2	6
4	4	6	4		2	10
5		2		1	1	2
6	1					1
Total.....	31	70	33	24	22	110

TABLE 5

Relationship of degree of friendship of sender of questionnaire for recipient of questionnaire to number of follow-up letters required to elicit a reply

NUMBER OF FOLLOW-UP LETTERS	DEGREE OF FRIENDSHIP				TOTAL
	0	1	2	3	
0	39	7	8	4	58
1	11		1	2	14
2	14	1	2	2	19
3	5	1			6
4	9		1		10
5	2				2
6	0	1			1
Total....................	80	10	12	8	110
Average number of follow-ups sent per reply received....................	1.25	1.10	0.75	0.75	1.14

The validity coefficients of the five colleges which know the reliability of their tests and wish to have the answers kept confidential are all under 0.50.

A tabulation of the relationship of willingness to have answers published and validity yields table 3. This table indicates an association between low or unknown validity coefficients and desire to have answers kept confidential.

In table 4 then, we have considered only validity and use or non-use of tests in relation to the number of follow-up letters required to secure a reply.

It is evident from this table that the possession or non-possession of a high validity coefficient is no guarantee of either early or late reply to the questionnaire. It is definitely known from several letters however that the replies were held up until the validity coefficient and reliability coefficients could be computed. This may account for a portion of the lack of relationship.

We have so far found no measure which is highly associated with the number of follow-up letters required. We might investigate the following in their bearing on the problem.

1. Size of the school
2. Endowment per student in attendance as an indirect measure of spare time of college recipient
3. Extent to which sender of questionnaire was known to recipient of questionnaire

The first two were not investigated. The third was investigated but by the method of reverse judgment, by having the sender of the questionnaire judge the extent to which he knew the recipient of the questionnaire on a four-point scale as follows:

DEGREE	DESCRIPTION OF TRAIT
0	Recipient unknown to sender
1	Recipient known slightly in a professional way to sender
2	Recipient known slightly in a social or friendship way to sender
3	Recipient known more or less intimately to sender

The results are shown in table 5.

The bottom row of table 5 indicates a somewhat greater tendency for the sender's better known friends to reply earlier than less well known recipients of the questionnaire.

The most important point to be settled is, of course, were six follow-up letters essential? Could we have used merely one follow-up only and have secured the same results. Table 6 answers one aspect of the question satisfactorily. It is evident—so far as this investigation is concerned—that substantially the same conclusion with respect to the *extent of the use of tests* could have been arrived at with no follow-up letters at all. With respect to other conclusions this would not necessarily hold. Additional replies did increase the *list of practical suggestions for improving tests*, even if they did not change materially the conclusions with respect to the *extent of the use* of tests.

TABLE 6

NUMBER OF FOLLOW-UP LETTERS	CUMULATIVE NUMBER OF LETTERS SENT TO DATE	PER CENT OF COLLEGES USING TESTS	CUMULATIVE PER CENT OF 110 COLLEGES REPLYING
0	110	74.1	52.7
1	162	73.6	65.4
2	200	72.5	82.7
3	219	73.2	89.2
4	232	72.0	97.2
5	235	72.5	99.1
6	236	71.8	100.0

SUMMARY

1. Sheer repetition of stimuli, by follow-up letters, is apparently the most potent method of eliciting replies from all recipients of a questionnaire. There were 52.7 per cent of replies to the initial questionnaire. Six follow-up letters were required to elicit 100 per cent of replies.

2. There is a decided tendency for those recipients who are best known to the sender to reply earlier than strangers.

3. There is no significant relation between size of validity coefficient and earliness of reply.

4. Colleges with low validity coefficients were more solicitous that their answers should be kept confidential than colleges with high validity coefficients.

5. In this investigation one essential conclusion—the percentage of colleges using or not using tests—would not have been materially changed if no follow-up letters had been used.

6. Many other factors—amount of spare time of recipient, teaching load of recipient, form, and content of letters; ease of forms for answering; size of institution—have undoubtedly their effects but were not investigated.

7. Where great accuracy of any percentage is desired, we can usually secure practically perfect returns on any well-worded and easily answered questionnaire of 30 questions by the use of some half-dozen follow-up letters. What percentage of replies is needed in most questionnaires for practical fixing of essential percentages is a subject for future research which it is hoped this article may stimulate.

8. The returns for the college group were one return for every 2.1 letters; for the trade school group of a previous investigation one return for every 5.9 letters. In both cases five follow-up letters elicited over 90 per cent of replies.

APPENDIX

The original or accompanying letter, and the six follow-up letters used in the second investigation are as follows:

Original letter:

Columbus, Ohio,
March 10, 1924.

Dear Sirs:

We have recently completed a survey of the official uses of intelligence tests in the colleges and universities of Ohio. We find a widespread use of the tests even in comparatively small colleges. We now desire to extend our survey in order to study intensively the administration and use of such tests in the larger colleges and universities, with a view to improvement of present techniques. It is expected that the results will be published.

We are fairly well acquainted with the available literature, but in many cases the practices which obtained at the time of such publications are now obsolete; and at best, conclusions derived from publications not specifically written with the point of view of answering the questions which need to be answered, should be officially verified before being treated as scientific data.

May we have your answers at your earliest convenience?

Very sincerely yours,

P.S. We are enclosing a copy of our experimental individual guidance card. The student encircles his scores on the various test variables and immediately notes his decile standing in each test whose norms (college freshmen) appear on the face of the card. On the rear, we plot cumulative credit points gained (A marks = 4; B marks = 3, etc.) against cumulative number of hours taken, and thus will detect *at an early date* those students who, although doing "passing work," are, nevertheless, as to quality of school marks in the (light cross-hatched) "danger-of-not-graduating" area of the card.

Original letter: 245 words; 25 question questionnaire accompanying; 58 replies received from 110 letters sent out.

1. First follow-up letter:

Columbus, Ohio,
April 9, 1924.

Dear Sirs:

Our records to date show that we have not yet received a return from you on the intelligence questionnaire sent you recently. We have not yet begun the tabulation of the replies, and accordingly there is still ample time for you to send in your reply. Please do so *even though you are not* officially using such tests. May we not have your reply at once?

Very sincerely yours,

P.S. By means of a simple one-page questionnaire, we have determined that 40 per cent of *all* Ohio Colleges use intelligence tests. The longer questionnaire sent you was designed to determine what is the best practice in a selected list of about 120 of the larger and better known Universities and Colleges of the entire country. To date 58 of these have responded. Will you not help to make our returns 100 per cent by responding to this first follow-up letter by sending in your questionnaire in order that the results of the replies may be published for the benefit of all.

First follow-up letter: 105 words; 14 replies received from 52 letters sent out.

2. Second follow-up letter:

Columbus, Ohio, April 25, 1924.

Dear Sir:

All but 38 of the 110 colleges and universities to whom we sent on March 12th, a questionnaire regarding the use of intelligence tests have replied. In a few cases the addresses were incomplete and so did not reach the person intended. Such addresses have been corrected to the best of our ability, and hence we are in doubt as to the reason *for our not yet having heard from you. We have been personally* "bothered" with questionnaires in the past. It was with some misgivings therefore *that*, after deliberation, we decided to "bother" busy college people with a questionnaire. We then reduced the work involved in replying to a minimum. You will note that practically all of the questions can be answered with either a check mark, a number, or a single word. That 72 colleges should have responded with but one follow-up letter is gratifying. If but 37 other people, in addition to yourself, respond to this letter we shall have full returns and can then be assured that we do not have a biased selection of colleges.

Perhaps you are not the person to whom the questionnaire should have been addressed; if so, will you please hand the questionnaire to a *colleague who is in closer touch with such personnel work?* And perhaps you have lost the former questionnaire (sometimes they go the way of the waste paper basket). At any rate, we are enclosing another for your convenience in sending us a prompt reply. Let us repeat that the tabulated results will be published for the benefit of all. May we not have the benefits of your experience with such tests?

Yours very sincerely,

Second follow-up letter: 275 words and a second copy of questionnaire: 19 replies received from 38 letters sent out.

3. Third follow-up letter:

Columbus, Ohio, May 20, 1924.

Dear Sirs:

Columbia, Yale, Brown, Newcomb College, Mount Holyoke College —91 of the 110 colleges originally sent the enclosed questionnaire on the uses of intelligence tests—have replied. Why is your college "among the missing?" We trust we shall not be required to report it "no return received" when we publish our report. If you do *not* use tests, please return the questionnaire with question No. 1, marked "No" in order that our returns may be 100 per cent complete. As a suggestion perhaps over the week-end you will have fifteen minutes in which you can answer the questions.

Very sincerely yours,

P.S. Only 19 more returns now needed to make 100 per cent. We received just 19 replies to our last letter. We did not wish to cut a stencil, but the job is a little too large for 19 typewritten letters,—so please excuse the carbon copy if you happen to receive one.

Third follow-up letter: 140 words; 6 replies received from 19 letters sent out.

4. *Fourth follow-up letter:*

Columbus, Ohio, June 11, 1924.

To the President (or Registrar in certain cases).

Dear Sir:

We have sent an original letter and three follow-up letters to the following address at your college in an attempt to secure replies to a questionnaire dealing with the results of the use of intelligence tests in your college:

Professor John Doe, Blank College

We have so far received no reply. To date all but 13 of 110 colleges throughout the country originally sent these questionnaires have replied. We are very anxious to have your college represented in the returns. Will you please either take 15 minutes and answer for us the questions included herewith, or hand the questionnaire to the proper person in possession of the facts called for?

Very sincerely yours,

Fourth follow-up letter: 100 words. Sent to a different official (usually president) of the colleges which had not yet replied: 10 replies received from 13 letters sent out.

5. *Fifth follow-up letter:*

Columbus, Ohio, July 8, 1924.

Dear Sir:

On the enclosed questionnaire on the uses of intelligence tests only your college and two other remain to be heard from. We hope to have University of X represented. Will you please request someone in your university in possession of the facts to fill out the questionnaire and return it to me? The questionnaire was sent to 110 representative colleges and universities of the United States.

Very sincerely yours,

Fifth follow-up letter: 66 words; sent to recipients of the fourth follow-up letter: two replies from three letters sent out.

6. Sixth follow-up letter:

Columbus, Ohio, August 5, 1924.

Secretary of the Entrance Board
Blank College

Dear Sirs:

I have sent the enclosed questionnaire to Professor Blank and to the President of your University and have thus far had no reply from either. Your University is the only one among 110 universities throughout the country, selected because of geographical and other representative characteristics, which has not replied to this questionnaire. We are very desirous of having complete returns on all of the colleges to which these questionnaires were sent. The general results of the questionnaire will be published. May we hope to have your reply at your earliest convenience.

Very sincerely yours,

Sixth follow-up letter: 91 words. Questionnaire enclosed. Since previous letters sent to one professor and the registrar had failed, this sixth letter was sent to the Secretary of the Entrance Board who replied immediately.

A DEMONSTRATION OF THE LANGUAGE DIFFICULTY INVOLVED IN COMPARING RACIAL GROUPS BY MEANS OF VERBAL INTELLIGENCE TESTS

S. L. WANG

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Racial differences in intelligence certainly constitute a very interesting and important subject. The wide interest in this topic has led many psychologists to attempt measurement of the differences by means of verbal intelligence tests. The findings have not been wholly consistent, but there has been fairly general agreement that other races tested as inferior to the native white Americans. However, whether these low scores were due to inferior intelligence was still an open question. There are clearly other factors besides comparative intelligence involved in such comparisons. The most important one is the language difficulty. It is the purpose of this study to make further investigation as to whether there is a language handicap involved in comparing racial groups by means of verbal intelligence tests.

MATERIALS

The results worked with in this study were from students at the Ohio State University. The test used was the Ohio State University Intelligence Test—to be further described shortly. The cases studied were 34 Chinese students, 83 men and 75 women colored students, 45 students born in Russia, and native born white cases paired with these as taking the same form of the test, of the same percentile standing (always within 5—usually exactly the same), belonging to the same college (Arts, Education, and Commerce and Journalism students being grouped together as sufficiently similar in entering students personnel, however) and class, of the same sex, and about the same age.

METHODS AND RESULTS

The method of handling, once the cases were thus carefully selected, was simple. The results for each racial group were tabulated by test, and then on a separate table the paired American cases. The median for foreign and paired American group was then found, for each test, and the median for the foreign group subtracted from the median for the American group. These differences appear in table 1.[1]

TABLE 1

Differences between foreign and colored groups and paired American groups on the separate tests of the Ohio State University Intelligence Tests

	RACIAL GROUP					
	Chinese	Male Negroes	Female Negroes	Male Negroes	Female Negroes	Russians
Forms	3 and 4	3 and 4	3 and 4	5 and 6	5 and 6	5 and 6
Number of cases	31	61	53	22	22	45
Test 1*	0	1	1	0	−2.5	1
Test 2	−1.5	−1	0	−2	1.5	1
Test 3	1	−1	1	2	5.5	−3
Test 4	1	−1	−1	4	2.5	1
Test 5	−8.5	0	3	0	0	0
Test 6	−5	1	1	0	0	1
Test 7	9	0	−1	0.5	1	0
Test 8				2	1.5	0

* The table shows that on test 1, Forms 3 and 4, the medians of the paired American groups are the same as that of the Chinese and are 1 step higher than that of the Male Negroes and Female Negroes. On test 1, Forms 5 and 6, the medians of the paired American groups are same as that of the Male Negroes and are 1 step higher than that of the Russians and 2.5 steps lower than that of the Female Negroes; and so on.

The tests are as follows:

	Forms 3 and 4		*Forms 5 and 6*
Test 1.	Arithmetical problems	Test 1.	Arithmetical problems
Test 2.	Proverbs	Test 2.	Definition
Test 3.	Same and opposite	Test 3.	Same and opposite

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[1] In this table results are given separately for the earlier Forms 3 and 4 and the recent revision—Forms 5 and 6.

Test 4.	Dissected sentences	Test 4.	Synonyms
Test 5.	Number series	Test 5.	General academic information
Test 6.	Analogies	Test 6.	Number series
Test 7.	General information	Test 7.	Analogies
		Test 8.	Reading

The following points are to be noted:

1. The Chinese are decidedly superior to the paired Americans on Test 5, Forms 3 and 4. The Americans average 8.5 steps below the Chinese. Test 5 is a test of number series and consequently involves very little language difficulty.

TABLE 2

Race differences in terms of sigma

	RACIAL GROUPS		
	Chinese	Negroes	Russians
Forms	3 and 4	5 and 6	5 and 6
Number of cases	34	44	45
Test 1	−0.13	−0.30	−0.16
Test 2	−0.93	−0.63	−0.29
Test 3	−0.04	−0.48	−0.34
Test 4	−0.85	−0.55	−0.42
Test 5	+0.31	−0.43	−0.38
Test 6	−0.33	−0.29	−0.12
Test 7	−1.80	−0.46	−0.31
Test 8		−0.59	−0.22

2. The Chinese are decidedly inferior to the paired Americans on Test 7, Forms 3 and 4. The Americans average 9 steps higher than the Chinese. Test 7 is a test of general information and consequently most involves language difficulty and knowledge of American life and customs.

3. There are no outstanding differences between the Negroes and the Americans, or the Russians and the Americans.[2]

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[2] These racial differences were also studied by measuring the deviations of the special racial groups from the median of a large number of unselected American-born students. A large number of native white American Freshmen were taken to represent the Americans (300 on

The results are presented in table 2. From this table is seen that on Test 1, Forms 3 and 4, the Chinese group is 0.13 sigma below that of the Americans. On Test 1, Forms 5 and 6, the Negroes and Russians are 0.30 and 0.16 sigmas below that of the Americans. The results evidently confirm the findings in table 1. This method is considered less satisfactory, however.

CONCLUSIONS

The writer's data suggest the following conclusions:

1. The Chinese test low because they are handicapped by language difficulty.

2. In the case of the Negroes and Russians, the language factor is not so appreciable.[5] The results from these two groups show no distinctive features: there is only a general slight inferiority.

3. The language difficulty involved, in studying racial groups, not thoroughly Americanized as to language by means of verbal intelligence tests, is quite noticeable. One should not, therefore, draw any definite conclusions concerning the relative intelligence of such groups and Americans unless there is some control of the language factor. The test of number series appears to be a good test to use in such studies, since it appears less affected by such influences. Non-verbal and performance tests

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Forms 3 and 4 and more than 2000 on Forms 5 and 6). These scores were next tabulated and the means of all tests were found. The sigmas of all tests were next calculated. The means of all tests for the special racial groups were found. Finally, the means of these racial groups were subtracted from the respective means of the American group. The remainders were divided by their respective sigmas. The quotients were the difference of the two groups in terms of sigma. For instance:

Mean of Test 1 for Americans..........	10	
Mean of Test 1 for Chinese............	5	
Sigma of Test 1 for Americans.........	20	
10-5..................................	5	remainder
Remainder/sigma or 5/20..............	0.25	sigma difference

[5] No evidence was obtainable as to how long those born in Russia had been in this country. It appears probable that most of them had been here since an early age and were thoroughly Americanized as regards language.

might be constructed so as to be more equally valid for several or all races.

4. There is need for more comparisons between races in their home countries, and comparisons involving more unselected and representative groups. The Chinese in the University are a selected group; their superiority on Test 5 is by no means to be understood to mean that the Chinese as a whole will be superior to the Americans as a whole on Test 5. The Russian immigrants are not probably representatives of their home folks. The American college Negroes, too, are not representatives of the Negro race in this country, not to speak of the Negro race as a whole.

I am much indebted to my teacher, Dr. S. L. Pressey, for his valuable aid.

VALUE OF WHITE SPACE IN ADVERTISING[1]

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White space is used to isolate an advertisement and so secure for it greater attention-value.

There is no question that the effectiveness of an advertisement is increased through the use of white space. But it is a serious question whether the increased effectiveness is worth the increased cost.

For instance in a certain advertisement two-thirds of the entire area is white space surrounding the one-third upon which appears the copy. If the space cost $1000, then $667 was spent only in getting attention. Was this expenditure justifiable? Did three times as many persons read the advertisement as would have done so if only one-third of a page had been used? Or, taking into account the number who read the advertisement and the impression made upon them, was there all told three times greater effect produced?

Fifteen years ago very little stress was laid upon the use of white space as an effective device. In fact at that time it was more customary to use for this purpose heavy black borders rather than white space. Today the emphasis is reversed, although a minority still prefer black instead of white.

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[1] The results of experiments I and II were obtained while the writer held a Research Fellowship in Advertising at Columbia University and were circulated by the Association of National Advertisers as Research Bulletin No. 1, October 16, 1912. The data in experiment III were secured by R. M. Paynter, Jr., while a graduate student at Columbia University, but have never been published. Experiments IV and V were conducted in 1913 at the request of a publishing house. As a result of their findings the publishers eliminated rules between their advertisements, a practice which is quite general today but was very exceptional then.

As these data on the value of white space are apparently all that are in existence the writer feels they should be given wider circulation at this time.

In an attempt to ascertain the relationship that exists between amount of white space used for isolation effect and the number of persons who notice and remember the advertisement, five experiments were performed.

SUMMARY OF RESULTS

1. Additional white space up to 60 per cent of the area of the advertisement itself is profitable.

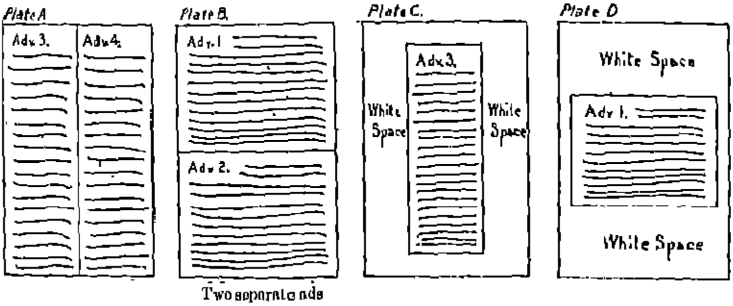

FIG. 1. SHOWING ARRANGEMENT OF ADVERTISEMENTS IN EXPERIMENTS I AND II

2. The greater the additional white space beyond 60 per cent the less profitable is the effect, for beyond that point cost increases faster than attention-value.

3. Twenty per cent increase in space, used as white space around the advertisement, gives the greatest increase in effectiveness, cost considered.

These results are based on a study of $\frac{1}{2}$-page and $\frac{1}{4}$-page advertisements. It is a question whether they apply to full-page advertisements.

I. THE EXTENT TO WHICH $\frac{1}{2}$-PAGE ADVERTISEMENTS CAN BE RECOGNIZED IMMEDIATELY AFTER BEING SEEN

Twenty vertical half-page advertisements and twenty horizontal half-page advertisements were arranged as in plates A and B of figure 1. These twenty pages were shuffled and shown in succession. The person being tested was then handed eighty half-page advertisements pasted separately on sheets of paper and asked to pick out those he had just seen. Forty of these 80 advertisements were the ones he had just seen and 40 were new advertisements.[2]

TABLE 1

Showing the per cent of individuals that noticed each ad of the 40 when shown two together (experiment I) and when shown separately (experiment II)

VERTICAL HALF-PAGE ADS						HORIZONTAL HALF-PAGE ADS					
Left ads			Right ads			Top ads			Bottom ads		
Ad number	Experiment I	Experiment II	Ad number	Experiment I	Experiment II	Ad number	Experiment I	Experiment II	Ad number	Experiment I	Experiment II
	per cent	*per cent*		*per cent*	*per cent*		*per cent*	*per cent*		*per cent*	*per cent*
1	22	50	2	51	70	21	20	43	22	18	34
3	43	58	4	40	81	23	29	49	24	47	63
5	25	17	0	54	07	25	43	44	20	35	05
7	36	30	8	51	58	27	36	53	28	28	62
0	25	45	10	30	74	20	28	60	30	17	64
11	22	65	12	57	68	31	33	05	32	15	35
13	47	84	14	17	50	33	21	41	34	33	56
15	30	61	10	27	70	35	43	47	36	28	54
17	45	65	18	25	34	37	20	33	38	14	34
19	31	46	20	24	45	39	18	33	40	27	40
Average....	32.0	53.0		38.5	62.0		20.1	46.8		26.2	50.7
Ratio.....	*100–161*		*100–163*			*100–161*			*100–194*		

The data are shown in table 1 under the caption "Experiment I." For example, advertisement 1, a vertical half-page advertisement that appeared on the left-hand side of the page, was recognized correctly by 22 per cent of the 10 men and 10 women who were tested. The average left hand, vertical ½-page advertisement was recognized by 33 per cent of the subjects; the right hand, vertical by 38 per cent, the top, horizontal ½-page advertisements by 29 per cent, and the bottom, horizontal by 26 per cent.

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[2] The method of conducting the recognition test and of handling the data is given in the writer's article, "The effect of time-interval upon recognition memory," Psychol. Rev., September, 1913.

II. THE EFFECT OF CENTERING ½-PAGE ADVERTISEMENTS ON A FULL-PAGE

In this experiment the forty half-page advertisements used in experiment I were placed separately on a sheet the size of a magazine page, 20 as shown in plate C and 20 as shown in plate D in figure 1.

The 40 advertisements were shown one at a time to 20 other individuals. The same recognition test was employed as in experiment I.

The data are shown in table 1 under the caption "Experiment II." The ratios at the bottom of this table express the increased attention value attributable to surrounding ½-page advertisements by ½-page of white space. This white space not only helps set off the advertisement but at the same time eliminates the distraction of a second advertisement.

The following results will be noted:

1. The increase in value of a ½-page advertisement in half-page space to a ½-page advertisement in full-page space is not proportional to the increased cost of the space. Instead of a ration of 100–200 we have 100–174, the average of 100–169, 100–163, 100–179 and 100–192.

2. The use of white space benefits good advertisements more than it does poor advertisements. As each of the forty ½-page advertisements were shown separately and centered on a full-page in experiment II, the data therefrom gives a measure of the attention and memory value of the advertisements. When grouped into four groups of ten advertisements each we have:

Advertisements recognized by form:
17 to 41 per cent, ratio 100–155
43 to 50 per cent, ratio 100–150

56 to 65 per cent, ratio 100 : 188
65 to 81 per cent, ratio 100 : 160

This result is unexpected. One would suppose that the poor advertisements would benefit more from elimination of distraction, often the elimination of a very good advertisement, than would good advertisements.

3. *Vertical ½-page advertisements secure greater attention-value than horizontal ½-page advertisements. The bottom* horizontal advertisement is less effective than the top. A possible explanation of these results is illustrated in figure 2. Apparently the nearer the optical center of a small advertisement is to the optical center of the page the greater is the chance the advertisement will be seen. *Another factor that contributes to the effectiveness of vertical ½-page advertisements is the ease with which the eye follows the type of narrow columns.* But this factor could not have influenced the data here as the advertisements were not exposed long enough for the person to do more than read the headings and take in the illustrations and general lay-out effect.

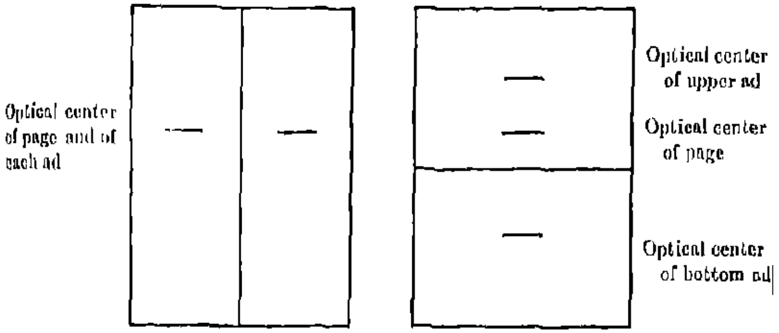
Optical center of page and of each ad
Optical center of upper ad
Optical center of page
Optical center of bottom ad

FIG. 2. SHOWING THE RELATIONSHIP BETWEEN THE OPTICAL CENTER OF THE WHOLE PAGE AND THAT OF THE DIFFERENT SHAPED HALF PAGE ADS

III. THE EFFECT OF CENTERING ¼-PAGE ADVERTISEMENTS ON A FULL-PAGE

The same procedure was followed here as in experiments I and II except that ¼-page advertisements were used instead of

½-page advertisements. In the first part four ¼-page advertisements were shown and then tested by the recognition method. In the second part the ¼-page advertisements were shown one at a time centered on a full-page.

The results are given in table 2.

Evidently using ¾ of the area of an advertisement as white space around the remaining ¼ area is an inefficient procedure. The cost is increased 4 times and the attention and recognition-value only 2½ times.

TABLE 2

	PER CENT	RATIO
Extent to which a ¼-page ad was recognized when shown with three others...........	20.9	100
Extent to which a ¼-page ad was recognized when shown, centered on a full-page....	52.6	251

TABLE 3

	EXPERIMENT I	EXPERIMENT IV	RATIOS
	per cent	per cent	
Vertical ½-page ads:			
Ads on left hand side...............	32.6	35.4	100-109
Ads on right hand side.............	38.5	42.3	100-110
Horizontal ½-page ads:			
Ads on upper half of page..........	29.1	41.0	100-141
Ads on lower half of page..........	26.2	25.5	100- 97
Average..............................	31.6	36.0	100-114

IV. THE EFFECT OF SEPARATING ½-PAGE ADVERTISEMENTS BY ⅓-INCH, INSTEAD OF $\frac{3}{16}$-INCH, OF WHITE SPACE—A HAIR LINE RULE BEING USED IN BOTH CASES

The ½-page advertisements were separated from each other in experiment I by approximately $\frac{3}{16}$-inch of white space. This white strip was divided by a hair-line rule such as is used between columns of copy in a newspaper and between advertisements in some publications.

In experiment IV, the white strip was widened to ½-inch; a rule also being used as in experiment I. The advertisements were tested in the same manner as in experiment I. The data are shown in table 3.

In this case we have added $\frac{5}{32}$-inch to the width of each of the two advertisements (½-$\frac{5}{16}$ /2). This amounts to an increase of 5.7 per cent in the case of the vertical advertisements and 3.8 per cent in the case of the horizontal advertisements, or an average of 4.75 per cent. With this increase of 4.75 per cent there is a resulting gain in attention and recognition value of 14 per cent.

The addition, then, of a small amount of white space between advertisements is an effective method of increasing their value, cost considered.

TABLE 4

	EXPERIMENT IV	EXPERIMENT V	RATIOS
	per cent	*per cent*	
Vertical ½-page ads:			
Ads on left hand side................	35.4	36.0	100-102
Ads on right hand side..............	42.3	45.2	100-107
Horizontal ½-page ads:			
Ads on upper half of page...........	41.0	39.6	100-97
Ads on lower half of page...........	25.5	29.7	100-116
Average...........................	36.0	37.6	100-104

V. EFFECT OF USING OR NOT USING A RULE BETWEEN ½-PAGE ADVERTISEMENTS

Another set of advertisements, identical with those used in the above experiments, was presented to a new group of twenty men and women. In this case the advertisements were shown separated by ½-inch of white space but with no rule. The only difference, accordingly, between experiments IV and V was the presence of a rule in the first case and the absence of a rule in the second. Table 4 shows the data.

Experiments IV and V were run years ago at the suggestion of the manager of a prominent engineering magazine, who was considering the advisability of discontinuing the use of rules between his advertisements in order to improve the appearance of the publication. He was fearful that elimination of the rule would lower the attention-value of the advertisements as they would tend, he thought, to fuse together. The experiment justified the change showing that white space alone was better in keeping advertisements apart than white space divided by a rule.

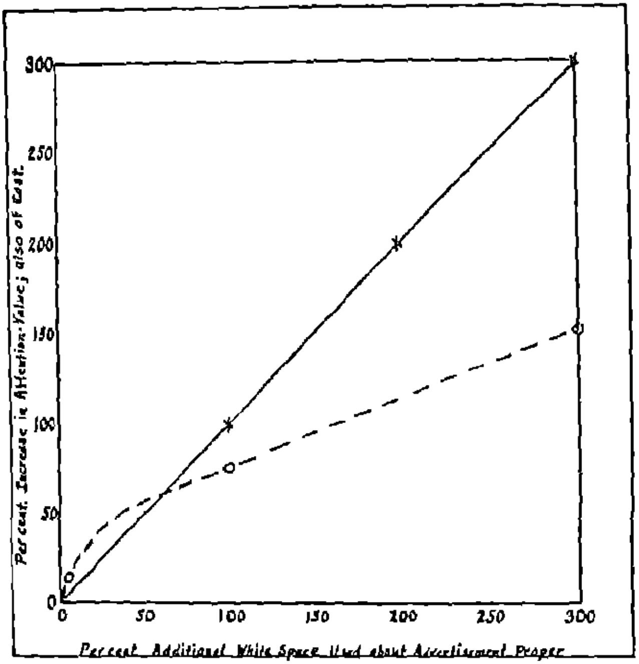

Fig. 3. Showing Effect of Using Additional White Space Advertisements in Terms of Cost (Straight Line) and of Attention-Value (Dashed Line)

When we look at a full-page advertisement we first comprehend it in its entirety. After the first glance, if so inclined, we proceed to take in the details one after another. This is the case if the advertisement is a good one. If it is a poor advertisement, lacking unity, we are forced to take in the several parts and then attempt to put them together. In the case of a page with many advertisements upon it, we are helped greatly if they are so displayed that each advertisement stands out separate from the rest. Then each can be reacted to easily as a whole; and later in detail, if we are interested. Apparently there is no better way of separating advertisements on a page, or the separate items within a department store advertisement, than to use white space between them. Rules and borders do not isolate as effectively as white space.

VI. CONCLUSION

In experiment II we found that doubling the area of an advertisement increased the attention and recognition-value by 76 per cent; in experiment III we found that quadrupling the area increased the value by 151 per cent; and in experiment IV we found that increasing the area by 5 per cent increased the value by 14 per cent. The relationship is shown in figure 3.

From these data it would appear that the effectiveness of a small advertisement can be profitably increased by buying more space and using this additional area as white space around the advertisement. It would appear that this statement is true as long as the additional space does not exceed 60 per cent of the area of the advertisement proper. If more than 60 per cent is used the increased cost will not be compensated for by a corresponding increase in attention-value. Furthermore, about 20 per cent additional area used as white space about the advertisement gives the greatest increase in effectiveness, cost considered.

This conclusion may be explained by assuming that the use of white space secures increased attention-value by (1) separating one advertisement from another[3] and (2) by increasing the size of the advertisement. The first factor is accomplished by a small amount of white space, certainly by 40 per cent or less.

[3] Further studies should be made using advertisements smaller than ¼-page; also with varying widths of white space between advertisements. The procedure employed here might well be used in various studies of distraction.

The second factor never pays at all. Studies by several investigators show that attention value increases nearly as the square root of the increase in area and not directly with the increase in area.

Another use of white space is to give dignity, prestige effect. This use is well illustrated in the advertising of Tiffany. It is quite likely that this concern secures sufficient value in terms of prestige to pay for the excessive amount of white space they employ. But if ten of their competitors commenced using this unusual lay-out also it is very doubtful if any of them, including Tiffany, would secure sufficient value to compensate for the cost.

CORRECTNESS OF JUDGMENTS BASED ON SENSATION INTENSITIES AND TIME ALLOWED FOR MAKING JUDGMENTS

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The object of this investigation is to determine the relationship of sensation intensities to time permitted for making judgments.

Experiments have been carried out with graduated sensation intensity stimuli in discrimination in brightness of grays, with the object of testing time relationship to judgments on the intensive scale of graduated stimuli.

Twenty subjects were used in the experiment, 10 men and 10 women, from the senior class and the Graduate School of the University of Texas. The apparatus was set up in the Psychological Laboratory of the University of Texas, under the direction of Dr. F. A. C. Perrin.

The apparatus for the Experiment consists of the following: A set of ten test-cards, a Graflex Focal Plane Shutter, and a pendulum time marker. Each card consists of two gray strips, 13 by 40 mm., on a white background, 10 by 10 cm. The cards were numbered from 0 to 9, corresponding to 10 different pairs of stimuli. Each card contained one strip of the lightest or standard gray and one strip of comparison gray. The card marked 0 contained no difference. The card marked 1 contained the minimal objective difference; and from 1 through 9 there was a graduated increase in the shade of gray, card 9 containing the maximal objective difference. Each card was numbered on the back in such a way that, when looking at the face of the card with the number up, the right strip is the darker.

The Graflex Focal Plane Shutter was an instrument so fixed that the cards could be exposed by pressing a button on the end of a string that was connected with the winding spring of the apparatus, and by pressing a button a second time the exposure of the card was shut off. Another card was then placed in the apparatus, the winding spring was turned twice by the observer, and another card was ready for exposure.

The pendulum time marker was used in the experiment.

The method of procedure for this experiment was as follows: The subjects were placed in front of a small table located in a north room, which had two windows, one giving a north exposure and the other a west exposure. The table was situated between the two windows, and at the right of it was another table on which was placed the pendulum. The Graflex Focal Plane Shutter was placed on the table and so arranged as to be directly in front of the eyes of the subjects who were seated with their backs to the windows and with their faces toward the gray walls of the experiment room. The test cards were kept on the table in front of the subjects but out of their vision.

The experiment was first explained to the subjects; the apparatus was next explained, and this was followed by a series of preliminary trials in order to get the subjects acquainted with the manipulation of the apparatus in the experiment. The subjects having been acquainted with the apparatus, they were next instructed that they were going to be tested for their stimulus limen. They were told that the darker shade of gray would be given on their right side and that when they perceived this difference they should report. Cards were then given beginning at zero and going up the stimulus scale. When the subjects reported a difference, the number of the card was noted, and a check was given on this number by beginning at the last card in the series and going toward the first. The card was noted at which the subjects reported no difference and compared to their first card. A still further check was given by presenting the cards in a haphazard order. After the stimulus limen was determined, the subjects were presented the

TABLE I

Group I, order I

SUBJECT NUMBER	NUMBER OF TRIALS	1	2	3	4	5	6	7	8	9	10	C	[illegible]
I	1	R R	R L	L L	L L	L L	R R	R R	R R	L L	L R	8	8
	2	R R	R R	L L	L L	L L	R R	R R	R R	L L	L L	10	9
	3	R L	R L	L R	L R	L R	R L	R L	R L	L R	L R	0	7
		1	1	½	1	1	½	½	½	½	½		
II	1	R	R	L	L	L	R	R	R	L	L	10	8
	2	R	R	L	L	L	R	R	R	L	L	10	9
	3	R	R	L	L	L	R	R	R	L	L	10	7
		3	½	½	½	½	1	½	1½	1	1		
III	1	R	R	L	L	L	R	R	L	L	L	9	8
	2	R	R	L	L	L	R	R	L	L	L	9	9
	3	R	R	L	L	L	R	R	R	L	L	10	7
		1	2	2	1	2	2	½	½	½	½		
IV	1	R	R	L	L	L	L	L	R	L	L	8	2
	2	L	L	L	L	L	L	L	L	L	L	5	3
	3	L	L	L	L	L	R	R	R	R	R	6	1
		2	0	3	½	½	2½	½	1½	2	½		
V	1	R	R	L	R	R	R	R	R	L	R	7	7
	2	L	R	R	L	L	R	L	R	L	R	6	8
	3	L	L	R	R	R	R	R	R	R	R	3	6
		1½	½	½	1½	½	½	1½	½	½	½		
VI	1	R	R	L	L	L	R	R	R	L	L	10	5
	2	R	R	L	L	L	L	R	L	L	L	8	6
	3	R	R	L	L	L	R	R	L	L	L	9	4
		1	2	6	2	2	1	2	2	1	1		
VII	1	L	L	L	L	L	R	R	R	L	L	8	6
	2	R	R	L	L	L	R	R	R	L	L	10	7
	3	L	L	L	L	L	R	R	L	L	L	7	5
		3	3	2½	3	4	3	3	3	½	1		
VIII	1	R	R	L	L	L	R	R	R	L	L	10	6
	2	R	R	L	L	L	R	R	R	L	L	10	7
	3	R	L	L	L	L	L	L	R	L	R	6	5
		2	3	2	½	2	5	3	4	2	2		

TABLE 1—*Continued*

SUBJECT NUMBER	NUMBER OF TRIALS	1	2	3	4	5	6	7	8	9	10	C	OC
IX	1	L	R	L	L	L	L	R	L	L	L	7	6
	2	L	L	L	L	L	R	R	L	L	L	7	7
	3	L	L	L	L	L	R	L	R	L	L	7	5
		1	1	1	2	3	1	2	3	1	3		
X	1	R	L	R	L	L	R	R	L	L	L	7	5
	2	R	R	L	L	L	R	L	R	L	L	9	6
	3	L	R	R	L	L	L	R	R	L	L	7	4
		2	2	2	1	1	1	2	1	1	1		

limen card, the card below the limen, and the card above the limen.

The subjects were divided into two groups of 10 subjects each, the order of cards and time being reversed on the second group.

Beginning at the right in table 1, the Roman characters stand for the subjects. In the next column are figures 1, 2, and 3, which represent the number of trials each subject made. The figures at the top of the page, from left to right, represent the number of tests in each trial. The first letter in each column from left to right represents the position in which the card was placed in the Graflex Focal Plane Shutter. The letter in the next column represents the judgment made by the subjects. In the last column on the right C represents correct judgments and OC represents the way the cards were presented.

One second of time was given with the judgments running parallel with 1, two seconds of time was given with the judgments running parallel with 2, and for the judgments running parallel with 3, the time taken is indicated by a figure under the judgment.

With table 1, group I, order I, the first trial was made with the column running parallel with 1, the second trial was made with the column running parallel with 2, and the third trial was made with the column running parallel with 3.

The stimulus limen was given first, the one above the stimulus

TABLE 2

Group II, order II

SUBJECT NUMBER	NUMBER OF TRIALS	1	2	3	4	5	6	7	8	9	10	c	oo
I	1	R R	R R	L L	L L	L L	R R	R R	R R	L L	L L	10	7
	2	R	R	L	L	L	L	L	R	R	L	7	8
	3	R	R	L	L	L	R	R	R	L	L	10	6
		1	1	1	½	½	½	½	½	½	½		
II	1	R	R	L	L	L	R	R	L	L	L	9	7
	2	R	R	L	L	L	L	L	R	R	L	7	8
	3	R	R	L	L	L	R	R	R	L	L	10	6
		1	1	½	½	½	½	½	½	½	½		
III	1	R	R	L	L	L	R	L	L	R	L	7	8
	2	R	R	L	L	L	L	R	R	R	L	8	9
	3	R	R	L	L	L	R	R	R	L	L	10	7
		1	1	1	½	½	½	½	½	½	½		
IV	1	L	R	L	R	L	R	L	R	R	L	6	2
	2	L	R	L	L	L	R	R	R	L	L	9	3
	3	R	L	L	L	L	L	L	L	R	L	5	1
		2	1	2	1	1½	½	1	1	1	1		
V	1	R	R	R	L	R	R	R	R	R	R	6	7
	2	R	R	L	L	L	R	R	R	L	L	10	8
	3	L	R	L	L	L	R	R	R	R	R	7	0
		1	3	1	1	2	1	2	1	1	1		
VI	1	L	R	L	L	L	R	R	R	R	L	8	2
	2	R	L	L	L	R	R	L	L	R	R	4	3
	3	R	R	L	R	L	L	L	R	L	L	7	1
		7	7	5	5	9	5	5	6	10	6		
VII	1	R	L	L	L	L	R	R	R	L	L	0	6
	2	R	R	L	L	L	R	R	R	L	L	10	7
	3	R	R	L	L	L	R	R	R	L	L	10	5
		3	2	1	1	1	1	1	½	1	1		
VIII	1	L	R	L	L	L	R	L	L	R	R	5	4
	2	L	R	R	L	L	L	R	R	L	R	6	5
	3	L	L	L	L	L	L	L	R	L	R	5	3
		5	2	1	2	1	2	2	2	1	2		

TABLE 2—*Continued*

SUBJECT NUMBER	NUMBER OF TRIALS	1	2	3	4	5	6	7	8	9	10	C	OO
IX	1	R	R	L	L	L	R	R	L	L	L	0	0
	2	R	R	L	L	R	R	R	R	L	L	0	7
	3	R	R	L	L	L	R	R	R	R	L	0	5
		½	½	½	½	½	½	½	½	½	½		
X	1	R	R	L	L	L	R	R	R	L	R	0	5
	2	R	R	L	L	L	R	R	R	L	L	10	0
	3	R	R	L	L	L	R	R	L	L	L	0	4
		1	1	1	1	1	1	1	1	1	1		

limen was given second, and the one below the stimulus limen was given third.

The order and time were reversed in table 2 by beginning with the trial parallel to the figure 3. Subjects were allowed all of the time that they wished for making their first judgments, and with this time they were given a card one number below the stimulus limen. The next trial they were given the column parallel to the figure 2 with 2 seconds with which to make this

TABLE 3

Group I, order I—accuracy table discrimination of grays

	F	I	S	JUDS					
1	1	2	0.70	10	0	2	0	10	8
2	1	2	1.00	0	0	0	10	10	10
3	1	2	1.20	0	1	1	10	9	9
4	1	2	1.90	4	5	2	6	5	8
5	1	2	0.80	7	4	3	3	6	7
6	1	2	2.00	1	2	0	0	8	10
7	1	2	2.60	3	0	2	7	10	8
8	1	2	2.55	4	0	0	6	10	10
9	1	2	1.80	3	3	3	7	7	7
10	1	2	1.40	3	1	3	7	9	7
Totals....................	10	20	15.95	35	16	16	65	84	84
Totals divided by 10....	1	2	1.595	3.5	1.6	1.6	6.5	8.4	8.4

judgment, and with this judgment they were given the card that was found to be their stimulus limen. The third trial they were given the column parallel to figure 1 with only one second in which to make judgments. This same procedure was followed for each subject in the group, care being taken to see that standard conditions prevailed for each subject.

Table 3, group I, order I, goes with the first group of 10 subjects in the experiment. Beginning at the left and going to the right, the first column represents the number of subjects; the column under F represents the fast time, which is one second; the column under I represents the intermediate time, which is two seconds; the column under S represents the slow time, which signifies that the subjects took all of the time they wished for making judgments. The first three columns under Juds represent the wrong judgments made. The last three show correct judgments made. The columns on the left in both right and wrong judgments go with fast time, the columns in the middle of both right and wrong judgments go with the intermediate time, and the last columns in both right and wrong judgments go with slow time, or the time in which the subjects

TABLE 4

Group II, order II

	S	I	F	JUDS					
1	0.05	2	1	0	3	0	10	7	10
2	0.60	2	1	0	3	1	10	7	9
3	0.65	2	1	0	2	3	10	8	7
4	1.20	2	1	5	1	4	5	9	6
5	1.70	2	1	3	0	4	7	10	6
6	6.50	2	1	3	6	2	7	4	8
7	1.25	2	1	0	0	1	10	10	9
8	2.00	2	1	5	4	5	5	6	5
9	0.50	2	1	1	1	1	9	9	9
10	1.00	2	1	1	0	1	9	10	9
Totals	16.05	20	10	18	20	21	82	80	78
Totals divided by 10	1.605	2	1	1.8	2	2.1	8.2	8	7.8

were at their leisure to make judgments. Parallel with Total is given the sum of each column, which is divided by 10, giving the average times and the average judgments of the experiment.

TABLE V

Accuracy Curve in Discrimination of Grays

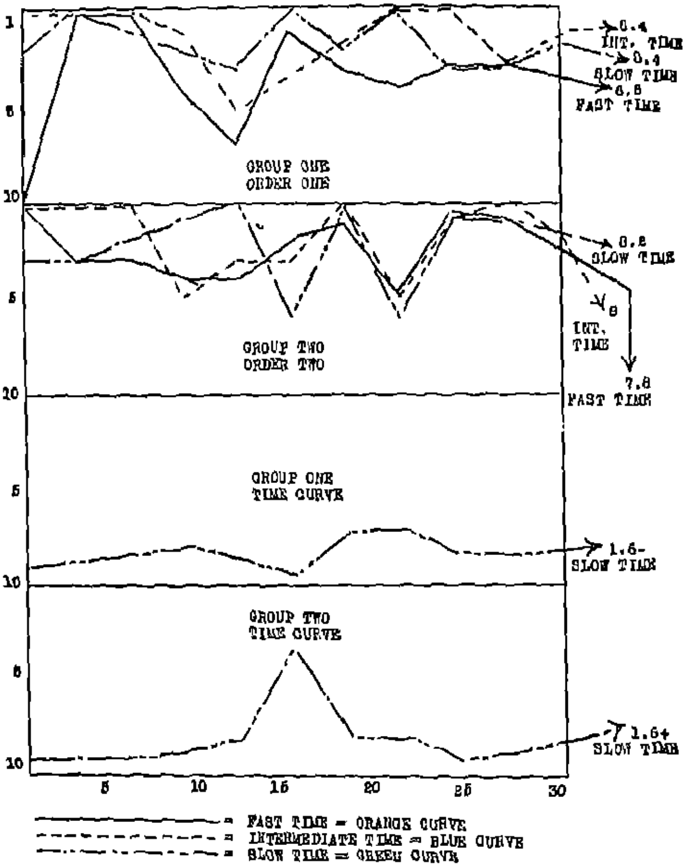

Table 4, group II, order II, go with the second group of 10 subjects in the experiment.

The results of experiment two are found in tables 3 and 4 and a graph of the results in table 5. The judgments in the column parallel with figure 1 are made by the first subjects, those in the column parallel with two by the second subjects, and those in the column parallel to the number 3 by the third subject, etc., throughout tables 1 and 2.

Table 5 is divided into four equal divisions, the ordinate of each division representing 10 subjects and the abscissa of each division representing 30 trials. Only one abscissa is numbered, but the abscissa of each divison is supposed to be numbered just exactly like the one at the bottom of the page. Each ordinate of each division is numbered separately; and as each subject had three trials and a different time for each trial, it was necessary to make a graph for each subject in the ratio of 1:3, that is, one unit was allowed on the ordinate while three units were allowed on the abscissa.

The accuracy curve in group I, order I, corresponds to table 1, group I, order I. The orange curve represents the fast time; the green curve represents the slow time; and the blue curve represents the intermediate time. This is true for both group I, order I, and group II, order II. Group I, time curve, goes with group I, order I. Group II, time curve, goes with group II, order II.

For the fast time in group I, order I, there were 6.5 correct judgments made out of 10 judgments. For the intermediate time there were 8.4 correct judgments made out of 10. For the slow time there were 8.4 correct judgments made out of 10. For the fast time in group II, order II, there were 7.8 correct judgments made out of 10. For the intermediate time there were 8 correct judgments made out of 10. For the slow time there were 8.2 correct judgments made, and by slow time we always mean that the subjects were given all the time that they desired for making judgments. This does not mean that the subjects took longer to make their judgments; for as is shown all throughout this experiment, the subjects made judgments in less time than they were given in the intermediate time.

The results of this experiment point out a relation of sensation intensity and time permitted for making judgments, which seems to be a cognitive process and not merely reaction to a stimulus. This was brought out in the following manner. The stimulus limen was given with the fast time in group I, which was one second. This proved to be too short, as only 6.5 correct answers were given out of 10. (This was an average for the entire group of ten subjects.) A card one number above the stimulus limen was given with the intermediate time, which was two seconds of time. The increased time and the increased stimulus made a difference. Of 10 answers 8.4 were correct, making a difference of 1.9. A card one number below the stimulus limen was given, and the subject had all the time desired to make judgments. The average time taken by the group was 1.6 seconds; and with this time 8.4 correct judgments were made out of 10, making a difference of 1.9. One second of time was found to be too short. The time for the greatest number of correct judgments for the first group was between 2 and 1.6 seconds, and this time was given, or rather taken, by the subject with a card one number below the stimulus limen.

An interesting thing brought out in this test is that if you give the subjects their own time to make judgments when testing for the stimulus limen, they take much longer than they do after starting the experiment. For this reason it was necessary to give all of the subjects one standard time when searching for the stimulus limen. The standard time chosen was three seconds. This accounts for the accurate reports on the card below the card selected as the limen by the subject; for when the subjects deliberated too long they were more likely to go wrong than when they made their judgment instantaneously or in a little less than a second and a half. In other words, the experiment shows that there are different limens with different times and the first judgment with each limen and time is the more correct. A long deliberation meant error.

When we turn to group II, order II, we find the same relationship. Although the order of the stimuli cards and the time was reversed, there was no appreciable difference. The slow judgment was given first with card one below the stimulus limen, and 8.2 correct judgments were made out of a possible

10. The time selected by the subjects was 1.6+ seconds. The intermediate time, or two seconds, was given with a card one number above the limen selected by the subject; and 8 correct judgments out of a possible 10 were given, a decrease of 0.2. The stimulus limen was given with the fast time, and 7.6 correct judgments out of a possible 10 were made.

The time curves averaged the same for both group I and group II, the average being 1.6 seconds for making judgments. The curves are made from the average time when the subjects in the respective groups took all of the time that they wished for making judgments. The curves for one and two seconds are not drawn, as the curves for a standard unit of time make a straight line.

This investigation seems to establish a cognitive process in response to stimuli without regard to the graduated scale of sensation intensity stimuli.

The process appears to reduce itself to perception, and perception has that little warmth of intimacy about it that is not found in sensation. The simplest kind of perception, pure perception, implies the grouping of sensations under the laws of attention. But they seem to be made up of more than sensations, since we see, feel, and hear more than is perceived to the eye, skin, and ear. *The sensations gotten from the stimuli are supplemented by images, and the perceptions become mixed perception, including complexes of sensory and imaginal elements.*

The data demonstrate that when the selected scale of sensation intensity stimuli was presented to the subjects, the sensations became perceptions. But that is not all; the perception had meaning. No sensation means; a sensation simply goes on in various attributive ways, spatially, clearly, intensively, etc. All perceptions mean: they go on also in various attributive ways, but they go on meaningly.

From a psychological standpoint meaning is always context; one mental process is the meaning of another mental process if it is that other's context. And context, in the sense used here, is simply the mental process which comes as a natural result to the given process through the situation in which the subject finds himself. At first, the situation is physical and external, and originally the meaning is kinaesthesis. The subject faces the situation by a bodily attitude; and the characteristic sensations which the attitude arouses give meaning to the process which stands to the conscious focus; and they are therefore psychologically the meaning of the process. The situation may be either external or internal, either physical or mental, either a group of adequate stimuli or a constellation of ideas. Image has now supervened upon sensation, and meaning can be carried into imaginal terms. Therefore, meaning for us may be mainly a matter of sensations of the special senses, or of images, or of kinesthetic or other organic sensations, as the situation under which we are placed demands.

But in order to have meaning there must be two sensations. When the sensation of it is accompanied by a strain, it becomes a perception of color in the place of a mere reaction to stimulus. It becomes *that gray something;* and it owes the *that something* to the strain content. However, meaning is not always conscious; it may be carried in purely psychological terms. A word, facial expression and inflection of the voice, a bodily attitude, a stimulus of any kind may press the nervous button, and consciousness is turned, unknowingly, into new channels.

Therefore, the graduated sensation intensity stimuli of grays appear to become sensory complexes with kinaesthetic settings and not simple reactions. The sensory complexes pass over into complex perceptions and the complex perceptions resolve themselves into the cognitive process and not merely reaction to stimuli. The process is that of comparing, not merely that of reacting to external objects.

There is a differentiation of the various sensations, and with this a certain time is required before passing judgments on the stimuli presented.

The time relation seems to be established through the cognitive process and not through the graduated stimuli.

NOTES AND NEWS

GODSEY LATIN COMPOSITION TEST

The World Book Company announces the publication of the Godsey Latin Composition Test. The aim of this test is to gauge the accuracy of Latin composition work at the same time showing the correlation of sentence-writing skill to knowledge of Latin grammar. It was devised and administered to many thousands of students in the nation-wide survey conducted by the American Classical League in 1921–1923 and is now published for general distribution. Norms are furnished, based upon 20,000 cases. The test requires about thirty-five minutes and any teacher of Latin can quickly learn to use it.

COLUMBIA HONORS DR. THORNDIKE

The Alumni Home Coming Day, February 19, 1926, of Teachers College, Columbia University, celebrated the twenty-fifth year of service rendered that institution by Dr. Edward L. Thorndike. The program consisted of addresses by Dr. Charles H. Judd, of University of Chicago on "A Century of Applications of Psychology to Education;" Dr. Agnes Rogers, Bryn Mawr College, on "The Contribution of Psychology to Child Welfare;" and Dr. Thorndike, on "The Psychology of Adult Learning." Following the program Dean and Mrs. Russell gave a reception to returning Alumni, officers of Teachers College, graduate and senior students and their friends.

INDUSTRIAL PSYCHOLOGY WELCOMED

THE JOURNAL OF APPLIED PSYCHOLOGY extends a cordial welcome to *Industrial Psychology*. This is a monthly journal having published its first issue in January, 1926. Striving as it does to bring results of modern psychology in the field of industry in popular form to those engaged in this work we wish for it every success. Under the vigorous and able leadership of Dr. Laird it should render most valuable service. From an examination of the first three issues we believe that it has made a very promising start. Those interested should address the Editor, Industrial Psychology, Hamilton, N. Y.

YALE STERLING FELLOWSHIPS

The Sterling Fellowships have been established by a gift of One Million Dollars from the Trustees of the Estate of the late John W.

Sterling to stimulate scholarship and advanced research in all fields of knowledge. They are open equally to graduates of Yale University and other approved colleges and universities in the United States and foreign countries, to both men and women, whether graduate students, or instructors or professors when on leave of absence who desire to carry on studies and investigations under the direction of the Graduate Faculty of Yale University or in affiliation with that body.

The Sterling Fellowships are divided into two general classes: Research or Senior Fellowships and Junior Fellowships. Candidates for Research or Senior Fellowships must have the Ph.D. degree, or must have had such training and experience in research as are indicated by this degree. Candidates for Junior Fellowships must be well advanced in their work towards the Ph.D. degree. These Fellowships are awarded on the understanding that the recipients shall not engage in teaching during the tenure of appointment.

The stipends of the Research or Senior Fellowships range from $1000 to $2500 or more, dependent upon the character of the proposed investigation. The stipends of the Junior Fellowships range from $1000 to $1500. For special purposes, such as carrying through to completion a piece of investigation, awards may be made of less than $1000.

Application blanks should be addressed to the Dean of the Graduate School of Yale University, New Haven, Connecticut.

COMMONWEALTH FUND GRANTS ANNOUNCED

Gifts for scientific, educational, and humanitarian work totalling $1,339,000, made by the Commonwealth Fund, of New York City, during the fiscal year ending September 30, 1925, were recently announced in the seventh annual report of the General Director, Barry C. Smith.

The endowment of the Fund, which was established in 1918 by gift of Mrs. Stephen V. Harkness, totals at present $38,701,000. Child welfare has been one of the chief interests of the Fund, involving grants to many different organizations in this field. The most recent enterprise of the Fund is a program of establishing hospitals in rural communities in the South. Special grants during the past year were made to the American Society for the Control of Cancer, Foreign Language Information Service for Americanization work, the Hunan-Yale College of Medicine in China, the National Association of Travelers Aid Societies, and many others.

PERSONNEL RESEARCH FEDERATION

During the past academic year the Personnel Division of the American Council on Education in Washington, D. C., received 440 calls for teachers. This shows an increase of 300 per cent over the previous year indicating the rate at which interest and confidence in the enterprise is spreading. The Personnel Division is being conducted on a high professional plane, charging no fees or commissions to registrants. An organization which is thus beneficial to teachers and executives, which operates on a national scale and within a limited budget can do its best work only as a coöperative enterprise. All college teachers and all graduate students preparing to teach in college are urged to register.

THE MODERN FOREIGN LANGUAGE STUDY

The Modern Foreign Language Study, under the auspices of the American Council on Education, expects to carry on extended research work during the present year involving a number of controlled experiments in the class-room and the wide administration of achievement tests. Among these tests of linguistic ability which in many cases will be necessary to construct in the four languages concerned, French, German, Italian and Spanish, are a Vocabulary Test, Silent Reading Test, a Translation-into-English-Test, a Written Composition Test and several others.

Two bulletins have been published by the Committee on Direction and Control which set forth the immediate and ultimate aims of the Study, as well as a list of problems for investigation and research. It is hoped that modern language teachers in colleges and universities will avail themselves of these bulletins and give consideration to the problems in the assignment of master's and doctor's theses. Those interested in the work may secure the bulletins by writing to The Modern Foreign Language Study, 561 West 116th Street, New York City.

BOOK REVIEWS

Donald A. Laird. *The Psychology of Selecting Men.* McGraw-Hill Book Company, New York, 1925. 274 pp. Price $3.00.

Dr. Laird gives an animated presentation of the difficulties and methods of employment psychology. The positive advances in this field seem for the time being to have reached a plateau so that recent volumes on the subject deal with a more or less familiar content. The outstanding merit of the present book is in the variety of "teaching aids" it utilizes and in its castigation of the fakir.

Problems are not merely described—they are also concretely set before the reader in some apt and diverting manner. After chapters on individual differences and the difficulties these provide in selection, some of the traditional methods of selection are reviewed critically. The rôle of the charlatan is vigorously exposed, accompanied again by concrete samples,—reproductions of fakir advertisements and announcements which are denounced in no mincing terms.

Useful sections are presented on ways to find a reputable psychologist and his characteristics when found. The road to scientific psychology is made so plain that the reader, though an employment expert, need not err therein.

The usual topics such as interview, rating scales, production records tests, statistical techniques, and the like, are discussed and illustrated by very suggestive charts and graphic devices. Tests are not given the position to which they have aspired in employment psychology and the psychologist's chief contributions appear in the form of statistical analysis.

Great freedom is exercised in the use of the work of others and the professional student will regret the inadequate documentation of most of these off-hand reproductions.

The volume should prove valuable to the employment man by giving a stimulating notion of the possibilities of development in his own work and by checking his gullibility for unscientific fads. To the teacher it will provide many suggestions of ways to enliven class work in this field.

H. L. Hollingworth,
Columbia University.

Albert T. Poffenberger. *Psychology in Advertising.* New York, A. W. Shaw Co., 1925. Pp. 632. $5.00.

Students of the psychology of advertising need no longer spend a good share of their time in the library searching for isolated articles on the subject. Poffenberger has performed a needed service in summarizing all the work on this topic which has been done by psychologists or through the use of psychological methods. The summaries are both adequate and impartial. It is a pleasure to handle the book for it is well written, well printed and bound and excellently illustrated. Psychologists and students should have it in their libraries for ready reference.

In its general outline the book follows the standard introductory textbooks in psychology. The first chapter presents the psychological attitude toward advertising. Chapters II to VI discuss the appeal, methods of measuring the strength of appeals and desire. Following these are chapters devoted to attention (five chapters), perception, comprehension, feeling (five chapters), memory and association (three chapters), belief and conviction, suggestion, and individual differences. One-fourth of the book is devoted to attention. This is justifiable in Poffenberger's case because psychologists have actually produced more on this topic than any other. Whether the original writers were well advised is another question.

The title "Psychology in Advertising" is nicely phrased for the emphasis throughout is on psychology, not advertising. A truer title would be "Psychology in Advertisements," for the book considers advertisements but hardly the process of advertising. There is very little or no utilization of current thought in advertising circles nor is there much appreciation of advertising as a business force. *Printer's Ink*, for example, is mentioned less often then *The Ladies Home Journal*.

As a rule we psychologists have studied advertisements but not the processes involved behind the advertisements. Little or no investigations have been made of the mental processes of consumers or dealers as such. We have been content to give a list of "instincts" or something of the sort and drop the matter there. Anyone who has attempted to present such a list, in the face of our pitiful lack of knowledge of the subject, must be very reluctant to criticize another's list. But the impression left by Chapter III that such desires as for cleanliness, beauty, economy and hospitality are the "bases of advertising appeals" certainly seems questionable.

Poffenberger recognizes what the reviewer considers the real function of advertising when he writes on page 502, "To have for sale a commodity that will satisfy a real human need, and to show in advertising that it will do so, and to show that it will do so better than any other commodity is to furnish the essential requirement for effective association," and again on page 520, "The most important association or bond that can be established is that between a desire or need and some specific means of satisfying the desire or need." The book is not however built around these concepts of "want," "solution" and "satisfaction" but about the old faculty psychology concepts of attention, perception, memory and the like. It is true that Chapters II to VI deal with desire, its characteristics, etc., but the reader is not supplied with instructions as to how to use this information. Instead he is launched into the problem of getting attention.

Personally the reviewer feels that here as elsewhere too great and esoteric a significance is attributed to this matter of "attention." It is used to explain too many of the mysteries of advertising. Surely there is no intention to convey the impression that there is a separate force called attention which can move mountains. Possibly in such cases reference has unwittingly been made to the activities of the organism as separate from the stimulus.

When an individual encounters an advertisement two different sets of factors determine his reaction; namely, the advertisement as a stimulus and the individual himself. In studying advertisements as stimuli we conclude that, other things being equal, this or that may be the case. No one can question the ascertained fact, if the procedure was sound. But in such cases we have practically eliminated the most important factor when we said "other things being equal," we have practically eliminated the dynamic organism. As a result psychologists have studied intensively the characteristics of advertising stimuli as they affect human beings, but they have almost ignored the characteristics of human beings as they react to advertisements. Human beings sometimes seek advertisements. Why? They read some advertisements and not others. Why? The complete answers are not to be found by analyzing advertisements but rather in analyzing prospective buyers.

Poffenberger had presumably something of this in mind when he wrote that associations are established through control of attention. "It appears," he says, "that the direction of attention and not spatial relations determined the association" (forward not backward). But let us use some term other than attention in such connections, let us make an endeavor to get at the motives that are involved. When we have done so we will have a far more meaningful and also more usable psychology of advertising.

EDWARD K. STRONG, JR.,
Stanford University.

WILLIAM FREDERICK BOOK. *The Psychology of Skill.* The Gregg Publishing Company, New York, 1925. Pp. 257.

In his second edition of the Psychology of Skill, the author has used the original text except minor changes in numbering chapters and sectional headings. Because of its careful and detailed analysis of the processes involved in the acquisition of skill, this new edition will be welcomed by the students of the psychology of learning. The first edition appeared in 1908 and has been out of print for several years.

In gathering data for the original study, the author employed a twofold method. By means of carefully constructed apparatus, he made an accurate record of the various physical aspects of the learning process in the case of each of his learners.

To supplement this record of the physical aspects, each learner wrote down from day to day a detailed account of his own mental and emotional activities during the practice periods. These introspections proved to be of great significance in the study of the learning processes. With these two forms of data before him, the author made his interpretations. This is an important phase of the study. Too often our studies in the learning process report only the objective aspects leaving the more subtle and perhaps more essential subjective factors untouched.

The particular form of the acquisition of skill investigated was learning to typewrite. Both the sight and the touch methods were included in the investigation.

The table of contents supplies an excellent outline of the book, and possesses unusual merit. The table of contents together with an adequate index makes it easy to locate and trace any desired aspect or phase of the discussion. There are also numerous cross-references in the body of the text thus making it comparatively easy to follow up the discussion of any topic. Frequent references are also made to literature then current.

A list of the major topics discussed at length follows: Detailed analysis of learning to write by touch; detailed analysis of learning to write by sight; some mental habits acquired in the course of the practice; retention of typewriting skill; how typewriting habits are acquired; phenomena influencing learning and the rate of work: explanation of the learning curves. The book closes with a general summary of the results.

The topic "the acquisition of skill" represents a theme that makes a strong appeal not only to those interested in industrial and mechanical activities but to the educator in general. In these days much of human life is expressed in terms of efficiency or skill in various types of motor responses. For this reason such studies as are reported in this volume are helpful and perform a distinct service for the student of the learning processes.

Some of the general conclusions resulting from the study follow:

1. Plateaus in the learning curves are not a necessary part of the curves. It is true that they are found in most curves but the evidence tend to show that with proper guidance of the learner they may be avoided. They appear when unfavorable conditions of learning develop.

2. The artist applies himself with great diligence to his task while in a favorable mood. He then relaxes and lounges until seized by another impulse. Certain evidence gathered from the data supplied by the study

tend to support the validity of the *artist's method* of work. There is a suggestion here that the most economical use of time demands that the learner should apply himself to the task only when he can enjoy it. There is the further suggestion that only *vigorous* application is economic.

3. The order in which the different *units* of material were mastered constitutes an important observation. The lower or smaller units were not made perfect before larger units of habits were attempted. The two orders of habits were developed and perfected more or less simultaneously. Here is the author's general summary of this point. *"The lower order habits were perfected in and through the formation of the higher, as a further development of the higher was dependent upon the final perfection of the lower."*

4. Another important factor in learning refers to the amount and character of the work done. This varied from day to day and was found to be closely connected with the degree of attention given to the task in hand. The degree of attention in turn depended very directly on the physical and emotional state of the learner.

WILLIS L. GARD.
Ohio University.

DAVID R. CRAIG AND W. W. CHARTERS. *Personal Leadership in Industry.* McGraw-Hill Book Company, Inc., New York, 1925. 245 pp.

In a note preceding the first chapter the authors say, "This book is a working plan, leading up to the final chapter on self-training. It should be read as a definition of qualities and character traits involved in effective personal leadership in industry. The last chapter contains a statement of the procedure which can be used in developing these abilities and traits. The reader who is already aware of the nature of his own shortcomings might do well to start with the last chapter, and take his cue from the suggestions contained in it."

If you read the last chapter first, and are concerned with developing greater executive ability as that relates to personal relations, the reviewer suggests that you read the summaries at the close of chapters next and, finally, read the text. This is precisely the reverse order to the way the book was made. It is, however, the way one usually discovers his faults or weaknesses. Also, if you read straight through, you will be too much interested in the illustrations to grasp fully the purpose as above described. In the final chapter, the authors say, "Thus this book was not written for purposes of idle entertainment, nor do its sponsors wish it merely to be read and laid aside." These are important warnings. The form of the book tends to conceal the serious purpose of its authors. It seems popular, and herein lies its danger. A single reading results in a feeling of over simplification.

The theory of the book is set forth in the preface. The authors believe that beside "labor problems" and "personnel administration," there exists a further problem, the relation of the executive to the individual worker. The book is not concerned with relations between individuals of equal rank or authority. With this viewpoint, the authors have concentrated on methods. The illustrative material is drawn from the personal experiences of successful executives. Quotations are frequently used. Without the first and final chapters the frequency of "don'ts" and do's" might well become confusing to any one seeking a unitary view of the purpose of the authors. Perhaps we are dealing here with a relationship which differs materially from the conventional and intimate relations of society. If so, those principles need not apply. Nevertheless, we shall need other books to demonstrate the differences. The niceties of the relations of the young, ambitious executive to his superiors are not touched upon in the volume.

Commendation is due the authors for a very readable book. The purpose of the presentation naturally prevents smoothness of style. The chapter on training where the attitude of the subordinate is used to carry the story seems more appealing to the reviewer. Unfortunately that method does not lend itself to proper self-analysis, which is the main objective. It should prove very useful as a distinct advance over the efforts of popular magazines to show us the successful executive at work with his subordinates.

C. S. Yoakum,
University of Michigan.

William F. Book. *Learning to Typewrite with a Discussion of the Psychology of Skill.* The Gregg Publishing Company, New York, 1925. Pp. xvii and 403.

This volume is addressed to teachers of typewriting and to those preparing to teach the subject. The material for the study represents the fruit of several years of investigation and conferences with experts in this skill. The three parts of the discussion supplies the reader with a comprehensive statement of the analysis of the practical and theoretical problems involved in teaching typewriting as well as the general laws of learning any skill.

Part I presents the psychology of skill including the laws which govern the acquisition of skill in general. In the one hundred fifty pages allotted to this discussion the author condenses the results of the many studies relating to the topic. The findings of the various studies are carefully organized and presented in a form which makes them easily accessible to the general student.

The reader may not care to accept the author's explanation of this type of learning in all instances. As one proceeds from page to page the feeling grows that such learning is nothing more than an organic or a physiological process operating exclusively through the effect of external and material stimuli. In this event learning becomes a physiological process and ceases to be a psychological product. However, on page 55, the author states his psychological position in the following quotation: "Intelligence has been generally defined as successful behavior, or ability to make a *successful* response to new situations or problems where such an adaptation is necessary or desirable. Many attempts have been made to determine the psychological factors or principles which control such successful behavior. One thing is clear; namely, that all the factors which condition this type of behavior are complex and still very much obscured. As a matter of fact, little is known about the *organic changes* which take place in the learner under such conditions, or about the psychological factors which favor or retard a learner's progress in *originating* new and successful responses in learning." It would thus appear that the author finds need for something more than purely organic or physiological processes to explain the acquisition of skill.

Part II presents a scientific analysis of the problems involved in learning to typewrite. In the 175 pages of the book devoted to this task, the author considers the following questions: The four problems confronting every learner of typewriting; the kind of habits that must be acquired; the order in which the habits should be acquired; how habits in typewriting originate and are fixed; the true basis for effective speed; the typical errors that appear during the learning period; some factors that modify the rate of progress and the limits of improvement. This phase of the discussion closes with the consideration of some means of measuring the progress made by the pupil. This list of topics is sufficiently comprehensive to give the reader a knowledge of the essential factors involved in acquisition of this special skill and to form the basis for an intelligent and economic procedure in teaching typewriting. When these laws and principles here presented become operative in the acts of those who direct the learning of pupils to typewrite, we shall then have gone far toward placing the acquisition of this special skill on a scientific basis.

Part III explains the rôle of the teacher in selecting and directing learners of typewriting. About 125 pages of the book are allotted this topic. Something of the special service rendered by the teacher in this connection may be gathered from the following list: the need, basis, and kind of direction supplied by the teacher; the guiding of the student in following the laws of habit formation; the developing and maintaining of the proper attitude of the learner toward the task; the evaluating of the progress made by the student; and the aiding of pupils to select the subject with proper insight into its possibilities. This section closes with an account of the special abilities of the world's champion typists.

While the book is not a study of the methods of teaching typewriting, it supplies an excellent basis for such a course. Here are found the results of many investigations presented in a usable form. The topics discussed are carefully analyzed and set forth in the table of contents. This is an excellent feature of the book. Besides we have a well selected list of questions and exercises at the close of each chapter. To some the book may appear to be tedious owing to the detailed and often repetitive character of some of the discussions. This is recognized by the author. It should however be remembered that the author here is engaged in a new undertaking and of necessity detailed explanations must be indulged in.

On the whole the book serves a special function in our educational literature and deserves to be imitated in other fields where the acquisition of skill is the major consideration.

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NEW BOOKS AND PAMPHLETS RECEIVED*

Books and pamphlets for review should be sent to James P. Porter, Department of Psychology, Ohio University, Athens, Ohio.

American Association for the Study of the Feeble Minded. The Journal of Psycho-Asthenics, Vo. XXX, June, 1924, to June, 1925. Edited by Howard W. Potter, M.D., Thiells, N. Y. 360 pp.

Attention-Value of Newspaper Advertisements. Richard B. Franken. Association of National Advertisers, New York, 1925. 55 pp.

Children's Drawings. Stella Agnes McCarty. The Williams & Wilkins Company, Baltimore, Md. 164 pp. $3.00.

Employer-Employe Relations in Hotels. W. I. Hamilton. The Williams & Wilkins Co., Baltimore, Md. 158 pp. $3.00.

Experience and Nature. John Dewey. Open Court Publishing Co., Chicago. 443 pp.

Genetic Psychology Monographs. Carl Murchison, Editor. Vol. 1, No. 1, January, 1926. Clark University, Worcester, Mass. $7.00 per annum.

Health Maintenance in Industry. J. D. Hackett. A. W. Shaw Company, New York. 488 pp. $5.00.

How to Make a Course of Study in Arithmetic. M. E. Herriott. University of Illinois Bulletin, Vol. 23, No. 6. Urbana, Ill. 49 pp.

Improvement of the Written Examination. G. M. Ruch. Scott, Foresman & Company, New York. 193 pp.

Intelligence and Immigration. Clifford Kirkpatrick. Mental Measurement Monographs. Serial No. 2, January, 1926. The Williams & Wilkins Company, Baltimore, Md. 127 pp.

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Mental Capacity of American-born Japanese Children. Marvin L. Darsie. Comparative Psychology Monographs, Vol. III, No. 15. The Williams & Wilkins Company, Baltimore. 89 pp.

Objective Psychopathology. G. V. Hamilton. C. V. Mosby Company, St. Louis, Mo. 354 pp.

* Mention here does not preclude further comment.

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Personal Leadership in Industry. DAVID R. CRAIG AND W. W. CHARTERS. McGraw-Hill Book Company, New York. $2.50. 245 pp.

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Preparation and Use of New-Type Examinations. DONALD G. PATERSON. World Book Company, Chicago. 87 pp.

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Psychology of Selecting Men. DONALD A. LAIRD. McGraw-Hill Book Company, New York. 274 pp. $3.00.

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A REVISION AND SOME RESULTS WITH THE MOORE-GILLILAND AGGRESSIVENESS TEST

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The measurement of traits of personality is probably receiving more attention than any other single problem in psychology. The first of these traits to be measured was intelligence. But it was soon discovered that while intelligence is the most important single trait, it is not the only one. Within the last few years numerous attempts have been made to measure traits other than intelligence. One of the earliest of these was the measurement of aggressiveness or forcefulness.

The first form of the test for the measurement of this trait was described in an earlier volume of this journal.[1] Since its construction the test has been revised and this revision has been used with several groups of college students and with a group of salesmen. It is the purpose of this article to describe the revision of the test and to present some of the results of its use.

In the earlier form of the test there were six parts, two of these, the "electric shock" and the "snake" test have been discarded, and a new test has been added. The test now consists of the following parts: (1) the eye movement distraction test, (2) the staring test, (3) the handwriting test, (4) the word reaction test, and (5) the time reaction test. The revised test together with the method of giving and scoring is herewith described.

TESTS I AND II, EYE MOVEMENT AND DISTRACTION TEST

The eye movement test consists in counting the number of movements of the eyes of the subject who is instructed to gaze steadily while adding a series of numbers as rapidly as possible. The adding is by increments of one. The subject is given a number between 30 and 50. For example, if 31 is the given number the subject adds 1 and gives the result 32, then he adds 2 to this sum and gives the result 34, then he adds 3 to this sum and gives the result 37, etc. The adding continues until nine numbers have been added which in the above example would give a final sum of 76. If the subject makes a mistake in any addition, adds the wrong number, or loses his place in the series, the observer states his problem correctly as for example, "41 and 5 are?" and repeats the problem every two or three seconds until a correct answer is obtained. The subject is then instructed by a nod or command to continue until the series is completed.

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[1] Moore, H. T., and Gilliland, A. R.: The measurement of aggressiveness. Jour. Applied Psychol., June, 1921, pp. 97–118.

In giving the first two tests the subject is given a preliminary practice in addition without the counting of eye movements or timing. This practice is followed by an addition in which the subject is allowed to add without staring, but the time required for the addition is recorded. This is followed by two additions in which the subject stares the observer squarely in the eyes. In these additions both the number of eye movements and the time required for the additions are recorded. Slight movements of the eyes as in looking from the eyes to some other part of the face are not counted; only those movements which are overt and apparent. Blinking of the eyes is not counted unless there is a movement of the eyes during the blink. A last addition is made without the staring but the time of the adding is recorded.

For the normal adding time, average the time for the first and last timed additions; and for the time with distraction, average the second and third timed additions, that is, the times during which the subject was staring. Record the normal adding time, the time with distraction, and the number of eye movements in the second and third additions. In these tests the observer has the difficult task of keeping the time required to perform the additions, counting the number of eye movements, and correcting the errors in the adding. Therefore wherever possible, two observers should be used, one for timing and counting the eye movements, and the other to give the numbers with which the additions are to begin and to correct the errors of the subject during the adding.

TEST III, WRITING TEST

For this test the subject must be provided with a sheet of paper and pencil or pen. On the paper he is instructed to write his name and address. The directions are: "Please write your name and address." No mention is made of the speed of the writing. If the subject inquires concerning the rate, he is told to write at his usual rate. The observer records the time required for the writing without attracting any more attention to the timing than possible. The subject is then told to re-write his name and address *just as rapidly as he possibly can.* Maximum speed is indicated not only by the wording of the directions but also by emphasis in repeating them. The observer again records the time.

TESTS IV AND V, WORD AND TIME ASSOCIATION TESTS

After a preliminary practice in word association with three or four words such as "book," "grass," "run," and "home," the subject is given the words "enterprize," "success," "company," "danger," and "death." The observer records the subject's word responses to each of the five words as well as the reaction time for each. The reaction time should be measured to fifths of a second but this can be done fairly accurately with the use of a good stop watch.

METHODS OF SCORING THE TESTS

The scoring method makes deductions from 100 points for each failure of the subject to meet the five types of requirement of the test. Corresponding to the relative importance of the different tests a maximum possible deduction of 40 points is allowed for test I for eye movements and 10 points for the distraction time of test II, and 25 points each for the writing and association tests. Stated more in detail the method of deductions for each type of failure is as follows. In the staring test 5 points are to be deducted for each movement of the eyes up to eight movements. Two points are to be deducted for each second of average time increase in excess of three seconds due to distraction. In the writing experiment ½ point is to be deducted for each per cent of increase *in excess of 20 per cent of the normal time required to write at the most rapid rate.* For example, if the normal rate is 20 seconds and the most rapid rate is 14 seconds, the 20 minus 14 divided by 20 equals 30 per cent increase. This is 10 per cent more than 20 per cent (the amount of increase in rate for an aggressive individual for which no deduction is to be made) for which 5 points deduction is to be made. In the word association test 2 points are to be deducted for each negative response to "enterprize," "success," and "company." Responses like "initiative," "push," "money," "power," "activity," "scheme," and "wealth" are to be considered positive responses for which no deductions are to be made. Responses like "failure," "enemy," and "fear" are to be considered negative responses for which deductions are to be made. One point is to be deducted for each colorless or doubtful response to each of these three words. Two points are to be deducted for each vivid personal type of response to "death" and "danger." Examples of such colorful suggestive responses are "enemy," "grave," "killed," "funeral" and "accident." The maximum deduction on the basis of word content for test IV is 10 points. For the time of response in test V one point is to be deducted for every fifth of a second in excess of two seconds for each of the five words. The maximum deduction to be allowed for time of response is 15 points.

The score of any subject may be obtained by totaling his deductions and subtracting the total from 100. For example, subject A made two eye movements in test I. His distraction time was 4 seconds in test II. His writing time was 10 seconds for normal writing and 8 seconds for his most rapid rate in test III. His responses to the five words were "mystery," "business," "busy," "afterwards," and "scared" in test IV. His reaction times were 1⅕, 1⅗, 1½, 2⅕ and 1 second. The deductions for this subject were therefore for test I, 2 × 5 = 10; for test II, (4 − 3) × 2 = 2; for test III, (10 − 8) × 10 = 20 per cent, and therefore no deductions; test IV, 1 + 0 + 1 + 2 = 4; for test V, 0 + 0 + 0 + 1 + 0 = 1. The sum of the deductions is 17 and the subject's score is 83.

The test was given to 315 college students. The average score for the group was 70.8 (median 72 P.E. 12). Of this group 185 were men and 130 women. The average for the men was 70.08 (median 73 P.E. 9½) and for the women it was 68.9 (median 71 P.E. 12½). These results indicate there is very little difference between the aggressiveness of the college man and the college woman. This seems reasonable. The greater variability of the women is probably to be explained by the fact that less initiative is required on the part of many girls than boys in attending college. On the other hand, a girl who must make her own way or meet other handicaps has a more difficult problem to face than the boy in similar circumstances. In other words, the girl is likely to be either more or less protected than the boy.

In order to be sure that the test is not just another test of intelligence, the scores on the aggressiveness test were correlated with intelligence test scores for three different groups. The first of these was a group of 50 liberal arts students for whom scores on the Brown University and three parts of the American Council of Education tests of intelligence as well as aggressiveness scores were available. The Pearson coefficient of correlation between the sum of the intelligence tests and the aggressiveness scores was +0.008. The correlation between aggressiveness scores and scholarship standing for these same students was +0.024. The correlation between intelligence and aggressiveness for 55 students in the school of speech was −0.027. The aggressiveness test and the Scott Mental Alertness test were given to 42 salesmen of classified advertising. The correlation between the scores of the two tests was +0.239 (P.E. 0.01). This correlation while not high is much higher than others. Whether this was due to the nature of the Scott test, to the character of the salesmen as a result of natural and artificial selection, to chance in such a small group, or to other causes, it is impossible to determine.

From these data it is evident that the test of aggressiveness does not measure the same thing that is measured by the ordinary intelligence test. Whatever it be that is measured, we can be sure it is something different. It now becomes our problem to try to discover whether the attribute or attributes measured by the test are to be found in situations where we would expect aggressiveness to occur. Of course we cannot hope to find a situation where this trait will be found isolated from all others. But we can find situations where the other traits tend to remain constant. Data from two sources already mentioned were available for this part of the study. These sources were the class in public speaking and the group of salesmen.

TABLE 1

Showing the percentile distribution of scores for 315 college students

PERCENTILE	SCORE	PERCENTILE	SCORE
0	25	60	76
10	40	70	80
20	56	80	85
30	64	90	91
40	69	100	100
50	72		

It seems reasonable to assume that aggressiveness along with intelligence is an important factor in public speaking. The speaker is instructed to look his audience squarely in the eyes, speak and assume a forceful attitude, and the like.

We have the intelligence scores, the aggressiveness scores, the grades in private work in speaking, as well as the final semester grades in speech. This last grade is a combination of the private work, written tests and grades on speeches made before the class. It should furthermore be noted that the quality of the speeches as well as the ability to present them was included in the grades in speech. The correlation between the grades in the private speeches and intelligence scores was +0.028. The correlation between intelligence scores and semester grades in speech was −0.125. If the grades in speech are reliable measures, intelligence, at least within the range of the intelligence to be found in a college class, is not a factor in successful public speaking.

Neither does aggressiveness appear to be an important factor in grades on private lessons in speech although it is a greater factor than intelligence. The correlation between the aggressiveness scores and the private lessons in speech was +0.20 (P.E. 0.01). However the correlation between aggressiveness and semester grades in speech was +0.34 (P.E. 0.08). This is a significant correlation, especially since the correlation between grades in speech and intelligence was negative. These results can be interpreted as meaning that aggressiveness as measured by this test is a rather important factor in success in public speaking. It is probably as important a factor as intelligence, when measured by the average group intelligence test, is a factor in scholarship.

It also seems very likely that aggressiveness plays no small part in success in many phases of modern business, especially in certain kinds of salesmanship. In order to further verify or disprove the value of our test, it was given to 43 salesmen in the classified ad department of a large Chicago newspaper. Due to difficulties in competition with salesmen of a larger newspaper, these salesmen had much difficulty in selling their space. In fact it was due to the heavy turnover that the writer was asked to assist in the selection of salesmen for the company.

So far as school training was concerned, the group varied from college graduates to some who had not finished the grammar school grades. The average score of the group on the Scott Mental Alertness test was 49.5 or about five points above the average college freshman. The average of the group on the aggressiveness test was 69.2 or just the college average.

But more important than these averages, is the degree to which high scores or low scores on the aggressiveness test indicates success or failure in selling advertising. Unfortunately there was no completely objective criterion with which to check these scores. The amount of space sold was not fair since some of the salesmen had been with the company many years and others only a few weeks. Experience is a large factor in such selling. Some men had good territory and others poor; some had more territory than others; some had preferred kinds of space to sell such as "automobiles for sale." These and other causes made the amount of space sold an unreliable index of sales ability. The best standard of comparison obtainable was the rating of the men by the sales manager and his two assistants.

TABLE 2

RANK	AGGRESSIVENESS SCORE	MENTAL ALERTNESS SCORE	RANK	AGGRESSIVENESS SCORE	MENTAL ALERTNESS SCORE
1. Ar.	90	69	14. Cu.	63	40
2. Wa.	04	57	15. Ro.	49	57
3. Br.	78	57	16. La.	58	71
4. Jo.	80	73	17. Ro.	45	35
5. Pi.	48	33	18. Ku.	04	39
6. Bu.	50	30	19. De.	74	64
7. Cu.	01	49	20. Re.	94	38
8. St.	68	32	21. Ha.	02	54
9. Ru.	70	53	22. Ip.	41	41
10. Mc.	81	54	23. Ma.	91	73
11. Ko.	64	50	24. Rl.	51	40
12. Cr.	00	70	25. Ha.	81	43
13. Ad.	08	50	26. Am.	04	30

By dividing the salesmen into an upper and a lower half on the basis of the average of the ranks given by the three managers, the general superiority of the upper group on the aggressiveness test is shown (see table 2). In assigning these ranks so far as possible factors other than selling ability were eliminated. Specific mention was made by the sales manager regarding Pi. (5) and St. (8) who were given high rankings and received low scores on the tests. When these men first applied for a position with the company they were refused. They persisted and were finally taken on trial. They did poor work for the first year but were persistent and have at last become excellent salesmen. Persistence rather than intelligence or aggressiveness, seems to be their chief virtue. Ma. (23) had been with the company only a few weeks when the ratings were made. Before the study was completed Ma. was standing fourth in a contest among the salesmen and the manager admitted that he had probably been rated entirely too low on first impressions.

Combining the rating of the three sales managers for the twenty-six salesmen, the correlation with the aggressiveness scores was +0.26 (P.E. 0.129). Although this correlation is not high, it is more than the correlation of +0.204 (P.E. 0.133) between this ranking and the scores of the Scott Mental Alertness test. By the method of partial correlation, reducing this factor of mental alertness scores to a constant the correlation between rank and aggressiveness is +0.23.

These tests go to show that both in the case of students in public speaking and the salesmen of classified advertising, the results of the tests correlate positively and significantly with measures or estimates of success in these fields. It is clear that aggressiveness is not the only factor in these situations. There are many others, some of which we may soon be able to isolate and measure. It may be admitted also that the test in its present form is not a perfect measure of the trait we have called aggressiveness. But it is clear that the results of the use of the test measure an important human factor or factors; it does have a practical value and it is worthy of further study and use.

SEX DIFFERENCES IN HANDWRITING

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INTRODUCTION

There are at least four investigations relevant to the problem of sex differences in handwriting. Awramoff and Meumann independently obtained pressure curves of handwriting by means of a tambour beneath the writing surface.[1] On the basis of differences in pressure and speed, as well as in size, rhythm and letter-formation, both concluded, Awramoff somewhat tentatively, that there are masculine and feminine writing types. Only a few subjects of each sex were used and several of the criteria were reversed, i.e., criteria which for the one experimenter were of the one sex, for the other were of the other sex.

Binet's experiment preceded a similar one by Downey.[2] The subjects of both investigations were engaged in estimating the sex of the authors of previously obtained handwriting specimens rather than in writing specimens themselves. In both instances, the samples were 200 or about 200 envelope addresses, half or approximately half written by members of each sex, and presented in unknown order. In both instances the subjects were unskilled, except for two of Binet's who were

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[1] Awramoff, D. Arbeit und Rhythmus. Philos. Stud., 1903, 18, 559, 561.

Meumann, E. *Vorlesungen zur Einführung in die Experimentelle* Pädagogik u. s. w., 1907, Bd. 2, 289, 290.

[2] Binet, A. Les révélations de l'écriture d'après un contrôle scientifique, 1906.

Downey, J. E., Judgments on the Sex of Handwriting. Psychol. Rev., 1910, 17, 205.

"experts." A summary of numerical results for unpracticed subjects follows:

	MEAN PER CENT OF CORRECT JUDGMENTS	RANGE	N
Subjects of Binet..............	69.8	65.0–73.0	10
Subjects of Downey............	67.3	60.0–77.5	13

Both investigators concluded that it is possible, with a certain amount of error, to determine sex from handwriting and Downey specified correctness "in perhaps eighty cases out of a hundred." An analysis of results by the latter led, further, to the belief that a typical feminine hand is "colorless, conventional, neat, and usually small;" while a typical masculine hand is "bold or careless or experienced, above all, individual."

All of the experimenters report "inversions of sex signs," i.e., instances in which an individual of one sex exhibits writing which seems more characteristic of the other sex. The last experimenter suggests that these inversions may depend on such factors as amount of writing done, age, or professional requirement; the latter factor coupled with early training being perhaps also a basis for the alleged sex differences themselves. Another possible basis for sex differences is suggested by the view that men exceed women in motor capacity.

THE PRESENT EXPERIMENT

The chief concern of the present experiment is the practical question of the degree to which the "ordinary," unpracticed or non-"expert" individual can determine sex from handwriting; more simply, what is the probability of correctness of judgment by such an individual. This study is characterized by the fact that a sufficiently large number of subjects served to make the results of statistical interest.

Materials and procedure

The handwriting specimens were, as in previous studies, 200 mail addresses; and half of them were written by each sex and without knowledge that they would be used experimentally. The writer of each sample was a different individual and the range of ages was, roughly, 20 to 60. All of the addresses were of the same street, city, and state. In a few cases the street number was different though in all except one it contained the same number of digits. Care was taken to control possible secondary criteria, like color, quality, texture or perfume of stationery. There was no intentional selection of the handwriting itself.

The addresses were cut from the envelopes excluding the names of the persons addressed, postage stamps and cancellation marks. By excluding the names, a suggestion-error possibly present in other investigations was eliminated. The addresses were gummed to 3-inch by 6-inch cards for convenience in examining. These cards were then arranged in chance order, stamped with numbers consecutively from 1 to 200, punched with holes at one end, and stacked on metal rods in such a way as to facilitate separate inspection in a fixed order.

Record sheets were prepared which provided for 200 judgments and the placing of any judgment in any one of four categories of confidence. The subject was requested to "look at the first sample and judge whether it was written by a man or a woman." He was asked to "put an M or F (masculine or feminine) on the proper blank after No. 1," and to "turn over the first sample." "Proceed in the same way with the second sample, and so on with the rest." "Do not turn back for comparisons." . . . . "After finishing, state if possible, any characteristics of the handwriting which seemed to be important in making your judgments." The subjects were told nothing concerning the relative numbers of masculine and feminine samples or whether or not all samples were by one sex alone.

The subjects were 92 in number, unpracticed, and unfamiliar with the handwriting of the authors of the samples. All except 13 judged the samples twice in sessions separated by not less than twenty-four hours nor more than three weeks. Subsequent study indicated no difference in the order of the results obtained with the longer as compared with the shorter intervals.

There were 61 men subjects being, with 5 exceptions, undergraduate students taking courses in psychology. The exceptions were 2 professors and 3 graduate students in psychology. Of the 31 women subjects, 20 were Normal students or teachers taking summer school courses in psychology and other subjects. The remaining 11 included 3 graduate students in psychology, 4 typists and secretaries, 2 library workers, 1 teacher, and 1 individual who gave occupation as "none." The age-distribution for all subjects ran from 17 to 60 with 73 per cent of the cases in the twenties. The data were obtained during the academic year 1924–1925.

Results

The results relating to degree of confidence in judgment are not reported here, but will be in connection with another investigation.

Tables 1 and 2 give the means of the percentages of correct judgments for all subjects. The essential difference in these tables is that the first differentiates the trials and the second the sex of the subjects. As indicated below table 1, the individual percentages, from which the means were computed, were figured in two ways: (1) on the basis of the number judged correctly out of the total of 100 samples of the given sex, and (2) on the basis of the number judged correctly out of all samples *judged* to be of the given sex. In an ideal chance situation the percentages of both sorts would have the value 50.

In table 1 the differences between the first and second trials show chance conformation with the $P.E._{\text{diff.}}$ and, further, the difference is not always in the same direction. It is, therefore, to be regarded as insignificant. In each case, the $P.E._{\text{diff.}}$ is less than 1 per cent. The means and the probability of correctness are, therefore, significantly above 50. Approximately 85 per cent of the subjects judged with more than chance correctness.

The means of the frequencies of the "masculine" and "feminine" judgments, *irrespective of correctness*, are not shown in the tables. It may be noted, however, that in each of the four situations in tables 1 and 2 (i.e., first and second trials, masculine and feminine groups of subjects), the mean frequency of the "masculine" judgments is greater than the "feminine,"

TABLE 1

Percentages of correct judgments of sex from handwriting

TRIAL	Mc	Fc	m	$\frac{Mc}{M}100$	$\frac{Fc}{F}100$
1	57.7	57	57.34	57.4	57.7
2	59	56	57.5	57.6	57.1
P.E.$_{\text{diff.}}$	0.95	0.04	0.66	0.63	0.68
$\frac{D}{\text{P.E.}_{\text{diff.}}}$	1.4	1.1	0.2	0.3	0.9

The figures in the first trial row are means from 92 subjects and in the second trial row from 79 subjects.

Mc = number of handwriting specimens judged correctly to be masculine, out of a possible 100 correct.

Fc = number of handwriting specimens judged correctly to be feminine, out of a possible 100 correct.

m = mean.

$\frac{Mc}{M}100$ = percentage of specimens judged correctly to be masculine out of all specimens judged masculine.

$\frac{Fc}{F}100$ = percentage of specimens judged correctly to be feminine out of all specimens judged feminine.

TABLE 2

Relative proficiency of the masculine and feminine judges

JUDGES	Mc	Fc	m	$\frac{Mc}{M}100$	$\frac{Fc}{F}100$
Masculine.................	57.8	56.1	56.04	57.2	56.8
Feminine..................	59.0	57.6	58.44	58.1	58.8
$\frac{D}{\text{P.E.}_{\text{diff.}}}$	1.3	1.6	2.1	1.3	2.4
Chances in 100............	81.0	86.0	92.0	81.0	94.0

the difference running from 0.9 to 5.3 per cent. This is in the same direction as Downey's "distinct preponderance of masculine judgments."[3] In the latter case the frequency of the "masculine" judgments was about 9 per cent greater than that of the feminine.

Table 2 compares the frequency of *correct* judgments by the masculine subjects with that by the feminine. The means for the feminine subjects are seen to be somewhat the greater, and, though not shown in the tables, this is also the result for both first and second trials taken separately.

The desirability of computing measures of reliability before stating conclusions concerning sex differences, especially when the observed differences are not large, need not be emphasized here.[4] The statistical chances in 100 that the differences in table 2 would occur in the same direction on subsequent occasions, i.e., that women really surpass men, range from 81 to 94.

TABLE 3

Inter-correlations

AGE OF SUBJECT, DURATION OF SESSION	AGE OF SUBJECT, CORRECTNESS OF JUDGMENT	DURATION OF SESSION, CORRECTNESS OF JUDGMENT
0.11	0.24	0.01

Table 3 exhibits correlations, based on the first trial, among age of subject, duration of session, and correctness of judgment; and shows the three coefficients to be low and positive. The correlation of 0.24 ±0.07 between age and correctness seems reasonable in view of the fact that we should expect correctness to increase with experience. The lowness of correlation may be due in part to lack of perfect correspondence between age and experience, to the short range of ages of the subjects as related to the precision of differentiation in handwriting judgments, and to overlapping of the sex criteria. Partial correlation, eliminating duration, does not affect this coefficient.

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[3] Op. cit., 209.

[4] Frasier, G. W. Jour. Educational Psychol., 1920, 11, 34-38.

If the correlation between age and correctness is performed separately for each sex the results are as follows: Men, −0.07 ±0.09; women, 0.53 ±0.09. The insignificant corrrelation for the men is possibly due to their very short range of ages, short both with reference to possible ranges and to the range of the women subjects. The women's age-distribution is extremely skewed to the right; but even after the distribution is made to approximate normality by eliminating the extreme cases, the correlation is still as high as 0.40 ±0.11.

Professor Downey kindly supplied the approximate ages of 12 of her 13 subjects and here also a positive relation was discovered between age and correctness, the correlation being over 0.60. Except for two or three, these subjects were all women.

It may be observed in connection with table 2 that the mean age of our feminine subjects was about five years in excess of the masculine mean; and possibly a correlative excess in feminine experience might account for the seeming sex difference in ability to judge handwriting. The mean age of Downey's subjects was also several years in excess of our masculine mean. It seems possible, on the other hand, that sex differences themselves, in handwriting as well as in ability to judge it, may depend chiefly on differences in experience which are *characteristic* of the sexes.

But whether or not that is so, it is of course certain that ability to judge handwriting depends in some degree on experience. Whether special practice or familiarity with handwriting can readily produce a noticeable improvement in estimating sex from it, is a question which has not received much attention. Downey allowed one of her subjects to review the errors made in the first 100 of her judgments and observed a higher per cent correct in the last 100 judgments.[5] Between the first and second trials of our experiment, 12 men subjects selected at random performed a special exercise. The subject was given two sets of 50 handwriting specimens, each set arranged like the main set of 200 except that one set of 50 contained only masculine specimens and the other only feminine specimens. The respective sets were labelled and the subject hence knew which specimens were written by which sex. He

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[5] Op. cit., 207.

TABLE 4

Effect of interpolating between the first and second trials

SUBJECT	TRIAL 1	TRIAL 2	INCREASE	DECREASE
A study and comparison of identified specimens				
47	52	56.5	4.5	
48	51.5	58	6.5	
49	58	56.5		1.5
50	56	59	3	
51	57	60	3	
52	58.5	56.5		2
53	64	63		1
54	59.5	50.5		9
55	51.5	54.5	3	
56	52.5	55	2.5	
57	47.5	49	1.5	
58	64	64		
Mean.......	56	56.87	2.0	1.1
Results of an equal number of random subjects who did not perform the interpolated exercise				
7	55	59	4	
8	62.5	65	2.5	
9	50	48		2
10	56.5	55		1.5
11	54	54.5	0.5	
12	46.5	49	2.5	
13	58.5	53.5		5
14	59.5	62	2.5	
15	65.5	58.5		7
16	52.5	51		1.5
17	57	58.5	1.5	
18	57.5	53.5		4
Mean.......	56.2	55.62	1.1	1.8

The figures in the "trial 1" and "trial 2" columns are individual percentages of correct judgments and correspond to the group means (m) in tables 1 and 2.

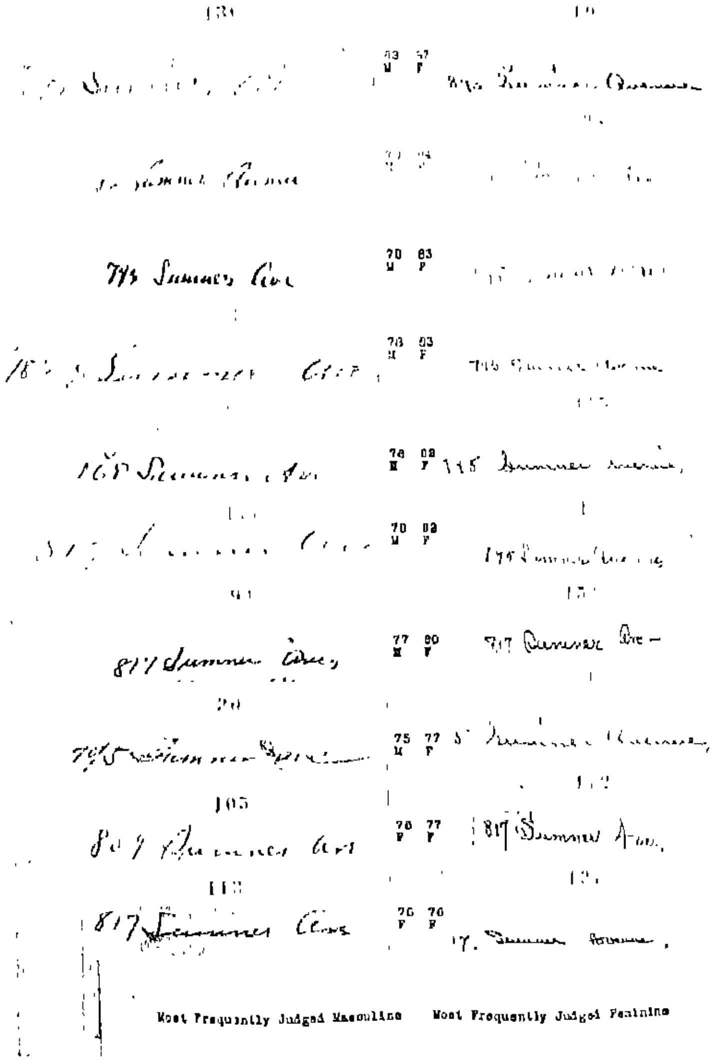

FIG. 1. THE 20 SPECIMENS MOST FREQUENTLY JUDGED MASCULINE OR FEMININE

was requested to "compare the two sets of known samples with the aim of learning to differentiate between the writing of men and women in general;" and to "make brief notes of any clues or marks of difference that seem important." This special exercise was performed in two periods, one just after the first trial of the main experiment and the other just before the second trial. The subject was asked to take as much time as seemed profitable. His notes were available for reference during the second trial of the main experiment. Table 4 compares performance in the second trial of the main experiment with the first trial, both for the experimental group and a control group of 12 men subjects. Inspection of the upper and lower halves of the table shows that the interpolated training had no significant influence on the percentages of correct judgments. For that reason the data from these subjects were also embodied in tables 1 and 2. Special experience of this character, then, would not appear to be specially effective.

Certain varieties of handwriting seem to be generally *regarded* as masculine and others as feminine. The sex of the writer, moreover, does not necessarily correspond to the general judgment; in other words, there are "inversions of sex signs." Both of these points are illustrated in figure 1 which may be explained as follows: The frequency, in the first trial, with which each of the 200 specimens was judged to be masculine or feminine by the 92 subjects was determined. The 10 specimens most frequently *judged* masculine and the 10 most frequently judged feminine were then abstracted and arranged in order of frequency. The first line of each of these specimens is reproduced in figure 1, those judged masculine being on the left. Both dimensions are reduced about one-half. The numbers and letters on the central strip show the frequency with which the respective samples were judged masculine or feminine and whether they actually were written by men or women. At the top of the column, e.g., "82 M" means that 82 of the subjects judged sample 130 to be masculine and that it actually was masculine. At the bottom of the figure, "75 F" to the right of sample 113 means that 75 subjects judged that sample masculine, though it was actually feminine. Samples

113 and 105 are the only inversions which appear in the figure. In other words, 18 out of the 20 most frequent judgments were correct. In every instance where more than 75 of the judges, or 82 per cent agreed, the judgment was correct.

The subjects reported scores of criteria of masculine and feminine writing, but as the writer knows of no way of discovering which were actually used in judging and which were rationalizations, they are not reproduced here. Presentation of a photographic reproduction of the specimens themselves seemed the best way of showing such typical differences as might be observable. In these 20 extreme cases, one is struck by the angles, irregularity, and slant of the specimens judged masculine and by the curves, regularity, and verticality of the feminine. Most of the feminine specimens, also, seem to be somewhat smaller.

SUMMARY

1. According to our results, the probability of non-"experts" correctly estimating sex from handwriting is of the order 0.55 or 0.60. This probability is not sufficiently high for individual judgments to be of practical value. It may be recalled, however, that various secondary criteria which are frequently present in everyday life were eliminated in this investigation.
2. There is some evidence of a positive relation between age of subject and ability to estimate sex from handwriting. It seems possible that a selection of older subjects might show a probability of correctness comparable to the results of previous investigators.
3. There is somewhat doubtful evidence that women are superior to men in estimating sex from handwriting.
4. The handwriting most frequently judged to have been written by men appears characteristically different from that most frequently judged to have been written by women.
5. In every instance examined where over 82 per cent of the subjects agreed in their judgment of a handwriting, the judgment was correct. It seems possible that group judgments may be of practical value.

THE EFFECT OF THE SIZE OF THE ADVERTISING SECTION UPON THE VALUE OF INDIVIDUAL ADVERTISEMENTS IN IT

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There has been a marked tendency in recent years to concentrate the advertising of the better class in a few media of very wide circulation. This has led to a necessarily enormous increase in the size of the advertising section of these standard magazines in which the best and most expensive efforts of the advertiser usually appear. This increase is indicated not only by the fact that the absolute amount of advertising space per issue is steadily gaining, but by the even more significant rise in the ratio of advertising to reading space in a given issue. For example, only about 13 per cent of the total space in the Saturday Evening Post was allotted to advertising in 1900 in comparison with approximately 60 per cent in 1920.[1]

The factor of wide circulation is, of course, a requirement of primary importance in the selection of an advertising medium. Of equal importance, perhaps, is the matter of circulation among a class of readers who would be most likely to become interested in the product to be marketed. On the other hand, it is fairly obvious that any increase in the amount of advertising carried by a given medium, beyond a reasonable limit, must result in a corresponding decrease in the value of the individual advertisement, insofar as its value may rest upon the likelihood of its being seen and remembered. Indeed, it is conceivable that there is a more or less definite "saturation point" in a medium, either absolute or relative to the amount of reading matter, beyond which even a factor of such importance as very wide circulation might well be sacrificed in order to insure better conditions of attention and impression.

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[1] A study of certain aspects of advertising in the Saturday Evening Post, by C. J. Warden et al., Jour. Applied Psychol., March, 1926.

Two more or less distinct problems arise in connection with the value of the individual advertisement in sections of different size. First, there is the question of the effect of increasing the size of the section upon the chances that an average advertisement in it will be seen by the reader. Does the average reader actually turn the pages of the magazine and observe as large a percentage of advertisements when the section is large as he does when it is small? Perhaps not, and yet a definite answer must await an experimental investigation of the habits of the general public in this regard. Such a study should include in its scope both the "flat" magazine and the segregated section of the more standard type, since there is the possibility that a different reaction in this respect may be given by the same individual to the two kinds of arrangement of reading and advertising space.

The second problem is that concerning the effect of size of section (or merely the amount of advertising space in the "flat" magazine) upon the attention value and memory value of the individual advertisement when actually seen. If the reader systematically turned every page in the section and thus saw each advertisement, would the impression from a given advertisement be as vivid and lasting, on the average, when the section was large as when it was small? The average advertiser would probably answer this question in the negative from a common sense point of view, without being able to state precisely when an advertising section should be considered large or small. This factor, among others, has led the advertiser to resort increasingly to the use of skilfull layouts, novel and attractive illustrations and color combinations in order to insure a lasting impression, should the advertisement be seen at all, in spite of the competition of the balance of the space. Regardless of these attempts, however, the brute fact of the increasingly large section and its consequences remain.

The primary aim of the present investigation was to determine the immediate recall value of an advertisement in sections of various size, and thus to obtain a quantitative measure of the value of an advertisement when it appears among few or many others.

One of the chief difficulties in making an experimental study of this problem is that of getting together a series of advertisements of approximately the same recall value to be used in the test. Advertisements differ very widely in mechanical and interest features as well as in degree of familiarity. On account of the complexity of the average advertisement it is practically impossible to equate groups, or series, in which it is used as the unit of recall, so far as the reaction value of the material is concerned. One or another group is likely to be favored by having advertisements that rank higher than the others in memory value.

In view of this fact it seemed best to carry out a preliminary experiment in which the material used should be relatively homogeneous. Instead of advertisements, small pen and ink drawings of familiar objects such as are used in intelligence tests (cow, house, bicycle, clock, etc.) were employed, all of which were very similar in size, style, and general familiarity.

Dummy magazines were made up of blank sheets of white paper of about the same size (6$\frac{9}{16}$ by 9$\frac{7}{16}$ inches) and weight as the standard magazine page. A single pen and ink drawing was mounted in the center of each sheet, always on the page that would lie to the right of the subject in looking through the booklet from front to back. Dummies were made up in 25-page, 50-page, and 100-page sizes.

A chance order was followed in arranging the pen and ink drawings in the 100-page booklet. Two dummies of the 50-page size were then made up, the one being exactly the same as the first half of the larger booklet, and the other a duplicate of the second half, so that the two 50-page booklets, when taken together, contained precisely the same material, arranged in the same order, as that of the 100-page booklet. In like manner 4 dummies of the 25-page size were made, each of which was an exact duplicate of one of the four quarters of the 100-page booklet.

A total of 87 college students was used as subjects, 31 for the 100-page size, and 28 for each of the other two sizes. The subjects for the 50-page size were divided into two groups of 14 each, and one group allotted to each of the two booklets of this size, and their results combined. Likewise, for each of the four booklets of the 25-page size, a group of 7 subjects was used, and their results combined. As will be observed, the results obtained for the three-sized sections are based upon the same materials, each of the 100 objects being presented the same number of times as any other, under each size. This method should operate as an adequate control of the possible sources of error arising from differences in the makeup and familiarity of the material.

The same mode of presentation was used throughout. The subject sat at a desk on which the given section was placed. He was required to turn the pages at the rate of 2 seconds per page, observing the pen and ink drawings as he did so. The time was indicated by a metronome located out of the view of the subject. Each unit of material, regardless of the size of the section, was thus given an equal presentation time.

Immediately after the dummy had been looked through in this manner, the subject was handed a paper and pencil and asked to record, without regard to the order of presentation, the names of as many of the objects as could be remembered. The time of recall was limited to 2 minutes for the 25-page size, 4 minutes for the 50-page size, and 8 minutes for the 100-page size, and was thus proportionate to the amount of material in the section. Each subject was scored on the total number recalled, a score of one being allowed for each item.

The results are given in table 1, the absolute scores of the first column being converted to percentage scores in column three. There is a consistent decrease indicated in the recall value of an individual pen and ink drawing as the sections are doubled in size. The differences are quite large and have a high degree of reliability. The amount of loss is relatively greater as a result of doubling the 25-page size, than when the 50-page size is doubled; in fact it is more than twice as great. It would be interesting to determine whether this apparent tendency for *the rate of loss to decrease with increasing size* would hold consistently through an extensive range of sections of different sizes.

The general method employed in the main experiment, in which advertisements were used instead of the pen and ink drawings of familiar objects, was the same as that described above in connection with the preliminary experiment. A few differences in detail should be noted. The booklets were composed of full page advertisements located on both sides of every sheet. They were not mounted and were stapled together after the manner of an ordinary magazine, so that the booklets might well have been mistaken for an advertising section taken directly from a standard magazine of the 6 by 9-inch size. Twenty-page, 40-page and 80-page sections were used. A total of 120 college men acted as subjects, 40 on the largest size, and two groups of 20 each on the two 50-page size, and 4 groups of 10 each on the four 25-page booklets.

TABLE 1

Effect of size of section on the recall of familiar objects

SECTION	AVERAGE	M.D.	PER CENT RECALL	RELATIVE DIFFERENCE	P.E. DIFFERENCE	COEFFICIENT OF RELIABILITY
				per cent		
25-page	8.5	1.9	34.0			
50-page	12.8	3.2	25.6	8.4	1.7	5.0
100-page	22.3	5.2	22.3	3.28	1.2	2.8

The values in the first two columns are based upon the absolute scores for the different sized sections, while the third column shows the relative scores. The last three columns show the difference between the 25- and 50-page section, and that between the 50- and 100-page section, and the reliability of these differences.

The presentation time was 1, 2, and 4 minutes respectively for the 20-, 40-, and 80-page sections. This allowed an average of 3 seconds per advertisement, although the subjects were not required to turn the pages mechanically at this rate. The metronome was not used since it appeared to be a distraction to many of the subjects. The recall time was limited to 2, 4, and 8 minutes respectively for the 20-, 40-, and 80-page sections. Recall of both commodity and specific brand were called for, and a score of one assigned to each, a particular advertisement being given a score of two, when both commodity and brand were recalled.

The results of this study appear in table 2 and require little comment. The third column indicates the relative recall value of an individual advertisement, when it appears in sections of the sizes indicated. A marked decrease in value occurs when the section is doubled in size. The amount of loss is slightly greater when the 20-page section is doubled than when the 40-page section is doubled, although the difference may have no genuine significance. The results here obtained agree in general with those of Strong as reported by Starch.[2]

TABLE 2

Effect of size of section on the recall of advertisements

SECTION	AVERAGE	M.D.	PER CENT RECALL	RELATIVE DIFFERENCE	P.E. DIFFERENCE	COEFFICIENT OF RELIABILITY
				per cent		
20-page	10.9	2.8	54.0			
40-page	15.9	3.7	40.4	14.2	2.3	6.2
80-page	23.1	5.5	28.8	11.6	1.6	7.2

The absolute score is indicated in the first column and the relative score in the third column. The difference between the 20- and 40-page sections, and that between the 40- and 80-page sections appear in column 4.

In making an application of the results to the actual advertising situation, due allowance must be made for certain points of difference between the usual manner of observing advertisements in a magazine section and the experimental procedure here followed. In order to secure equal presentation time per unit of material, it seems quite necessary to adopt some such method as that here used, involving a systematic turning of the pages at a fairly constant rate, although this is probably not the most usual mode of looking through an advertising section in ordinary life. In the latter instance, the time per advertisement, even when the pages are turned in order, will vary according to the interest of the reader. Then, there is the factor of the attitude of the subject which is likely to be more or less artificially determined in any laboratory situation. A definite task, not of the subject's choosing, has been set for him which requires observation according to specific rules, to be followed by a report of his observations. These artificial conditions are obviously necessary in order to control procedure and isolate the factor of size of section, and thus determine its effect upon the recall value of an average advertisement. This factor doubtless operates in much the same manner in practical life situations as we have found it to do in the laboratory.

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[2] Starch, Principles of Advertising, p. 796ff.

Inasmuch as one-half of the 80 advertisements used in the above experiment were colored while the other half were black and white, a comparison of the two groups in recall value became possible. No attempt had been made, in selecting the material for the two groups, to equalize them in respect to color combination, mechanical or interest features, or degree of familiarity, and hence no genuine isolation of the factor of color was possible. An analysis of the results on this basis, in which the scores of the two groups from the sections of all sizes were pooled, gave an average recall score for the black and white group of 13.6 compared to 14.4 for the 40 colored advertisements. Since the probable error of the difference is 18.7 or only 0.042 times the difference (0.775) no significance can be attached to these relative scores.

A further analysis of the results was possible on the basis of the size of the illustration appearing in these 80 full-page advertisements. Of the 53 advertisements having an illustration less than a half page in size, only 20 (38 per cent) were recalled 14 times or more in the pooled scores for booklets of all sizes, while of the remaining 27, with illustrations one-half page or more in size, 16 (60 per cent) were recalled 14 times or more. The average recall score for the former group was 12.1 while that for the latter was 18.6. A correlation, by the fourfold method, between the size of the illustration, as thus divided, and effective recall gave a coefficient of +0.33 ± 0.123 which would seem to indicate a tendency for a large illustration to be, on the whole, advantageous to efficient recall. However, the advertisements were wholly unselected, so far as features other than size of illustration are concerned, and the result here indicated may be due, in part at least, to these uncontrolled factors.

TABLE 3

The factor of serial position in the recall of advertisements

	SECTION									
	I	II	III	IV	V	VI	VII	VIII	IX	X
20-page	28	26	21	22	20	22	20	22	19	22
40-page	13	17	14	20	14	15	17	17	14	16
80-page	11	11	14	11	14	10	9	13	12	12

The values under Roman numeral I indicate the average recall score for the first two pages of the 20-page section, the first four pages of the 40-page section, and the first eight pages of the 80-page section, in the order named. The scores for each successive tenth of each of the sections appear under the corresponding Roman numeral.

A final analysis of the data was made to determine whether or not serial position in the section was a factor in determining the efficiency of recall, under the conditions here obtaining. In the main experiment with the advertisements, the page order of each section had been systematically shifted from subject to subject, so that every advertisement appeared the same number of times as any other in each position, for the booklets of different size. The factor of serial position was thus effectively isolated.

The value of serial position in the three sized sections is shown in table 3, in which contiguous positions have been grouped into a series of 10 successive positions in each case. Thus, the value under the Roman numeral I in the table is an average of the recall scores of the first two pages of the 20-page book; the first four pages of the 40-page book, and the first eight pages of the 80-page size, in the order named. This method of grouping was adopted as a matter of convenience in comparing the data of the three sizes of section.

The results indicate that the first 4 pages of the 20-page size are positions of especial advantage in recall which suggests the possible operation of the law of primacy in this, as in other types of serially presented material. No evidence of the operation of the corresponding law of recency is indicated, the value for the last two pages (under Roman numeral X) being no higher than for pages 11 and 12 (under Roman numeral VI) in the middle of the section. In the 40-page, and 80-page sizes, there is a considerable amount of variation in the scores for the different positions as grouped, but no tendency is apparent so far as position in the section taken as a whole is concerned. Primacy and recency are evidently of little or no importance under the conditions here employed. It is not unlikely that the unusual complexity of the units, as compared with the usual laboratory memory materials, together with the extreme length of the series here employed, may have counterbalanced any advantage arising from the operation of primacy and recency.

In any case these results suggest that the factors of primacy and recency, as these terms are commonly used in studies of memory, can hardly be responsible for the superior value commonly supposed to attach to the first and last few pages of the section, over the intermediate positions. The accepted superiority of these preferred positions more probably depends upon the fact that they are much more likely to be observed, in the ordinary course of reading the magazine, than are the more centrally located pages of the advertising section.

AN EXPERIMENT IN TESTING ENGINE LATHE APTITUDE[1]

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This paper is a continuation of the work of Everett F. Patten, which appeared in this JOURNAL in 1923 (vol. vii, pp. 16–29). Since the purpose of the investigation is the same, and the methods the same in certain important respects, it is not desirable to describe the experiment in its entirety. If the reader is interested he may refer to the former article. The chief differences, however, in procedure and results as well as several innovations in the process, are here explained and contrasted with Patten's work.

The purpose of the investigation was to assemble a battery of tests which would be useful in the prediction of the aptitude of a beginner for learning the engine lathe. The subjects were Freshmen in the Engineering School of the University of Wisconsin, and the tests were made while the subjects still had the minimum of experience in lathe work. The criterion adopted was the quality of the work turned out in the course of the semester.

The five pieces of lathe-work turned out (four of cast iron and one of steel) were, as in the former investigation, carefully measured with micrometer calipers. The deviations from the blue-print specifications in each of the twenty-seven measurements taken from each student's work, were recorded, each measure subjected to check distribution. The constant median set for each of the measures was 85 per cent. The scores for each subject in each measurement were computed on a percentage basis (Patten, op. cit.). At this point the criterion was improved over Patten's work, we believe, by assigning weights of varying magnitude from one to eight (the total of weights being one hundred), the comparative weight for each measure being determined by the relative difficulty of the operation measured. The measurements were taken and the weighting estimates were made by Mr. Brecky of the Shop Practice Department. The criterion thus carefully determined was very largely objective, and, we believe, reliable.

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[1] The writer begs to acknowledge the fact that the general plan of the investigation was worked out by Dr. C. L. Hull of the Psychology Department, University of Wisconsin, and that his general supervision throughout was invaluable. The writer thanks Mr. Brecky for his aid in administering the tests and especially for his careful measurement of the criteria. The several student assistants deserve credit for their care in administering the tests. He is obviously greatly indebted to Mr. Patten for the free use of the results of his work, and to Mr. Van Tassel for certain of his results, the use of which is explained later.

Although Patten, in his work, obtained a multiple correlation coefficient of 0.55, it was believed that a substitution of new tests for some of those which had yielded low coefficients might appreciably raise the prognostic value of the team. Table 1 shows the tests used by Patten and those used by the writer, arranged in parallel, together with yield of zero order coefficients.

The measures taken through the use of the Coördination test apparatus (Patten, op. cit.), show, as may be seen, a decline in one from 0.42 to 0.21; in another, plus 0.19 to minus 0.16; in another, 0.36 to 0.166. Then there is an increase in the fourth from 0.03 to 0.236. The present writer's figures may be considered the more reliable for three reasons: (1) they are based upon the examination of seventy-seven subjects, whereas there were only sixty in the other investigation; (2) the "Coördination distance" measure yielded for Patten a "plus" correlation which would, as he remarks, indicate that the more deviating from the path in the test, the better the worker, whereas one would expect the opposite to be true. The present writer's minus 0.16, then, is the more likely, though not high enough to be used in the final team; (3) the low "diagonal deviation" yield, in Patten's work was not as high as he expected, and his

PATTEN		GLEASON	
Test	r	Test	r
Coördination test, time	−0.42	The same	−0.21
Coördination test, distance	+0.19	The same	−0.16
Coördination test, diagonal time	−0.36	The same	−0.165
Coördination test diagonal deviation	−0.03	The same	−0.236
Number checking, rights	+0.055	(Omitted)	
Number checking, wrongs	−0.035	(Omitted)	
Lock test, time	−0.20	The same	−0.05
Box test, time	−0.27	The same	−0.16
Box test, errors	−0.11	(Omitted)	
Cylinder gauging, time	−0.13	(Omitted)	
Cylinder gauging, deviations	−0.20	(Omitted)	
Match square, time	+0.16	(Omitted)	
Circle centering, time	−0.20	(Omitted)	
Circle centering, grades	−0.27	(Omitted)	
Woodworking, time	−0.119	(Omitted)	
Woodworking, deviations in dimensions	−0.095	(Omitted)	
Woodworking, deviations in angles	+0.08	(Omitted)	
		Tests added:	
		Coördination, diagonal rate	−0.07
		Cube test, time	−0.04
		Head measurements, front, combined	+0.08
		Head measurements, back, combined	+0.127
		Technical Information, grades	+0.433

prediction that a retest would raise the coefficient was realized.

The "lock assembly" test has suffered markedly each time it has been given. In a preliminary investigation by Nelson, along the same lines but with fewer subjects, the test yielded a coefficient of −0.33. Then follows Patten with −0.20, and the writer with −0.05. The test is largely one of ingenuity, and one would scarcely expect a high correlation with lathe work, which seems to require but little of that ability.

The "box directions" test (described by Patten) also suffers a drop in its prognostic value, according to results herein given—minus 0.27 down to minus 0.16. Its low correlation with the other measures saved it for final use, however, and there can be little doubt but that the test taps to a certain extent the ability to follow blue-print directions, which is so necessary in lathe-work.

The "cube" test was designed to tap what was considered a necessary constituent of lathe aptitude, namely a sense of the relationship of the parts of an object to the assembled whole, together with the ability to apply method in assembling the parts. So a group of twenty-seven small wooden cubes were placed on a glass plate before the subject, arranged in little piles, one pile consisting of those painted on three faces, another of those painted on two faces, another, on one face, and a last single unpainted cube. All of them, properly assembled would form a large cube painted on all six surfaces, with no painted surfaces in the interior. The time measure was taken, but the correlation with the criterion was very small, and the positive correlation with the lock assembly test was rather high, which latter might be expected.

A number of head measurements were secured. The instrument employed was a special cephalic radiometer designed by Dr. Hull. The instrument was so constructed that, from the mid point of an imaginary line drawn from ear to ear through the head as axis, the exact radial distances to various points on the skull may be readily measured. Among these, for example, were distances to the point of the chin, the base of the nose, and various points on the cranium. On inspection of the records it was seen that two groups of measures, the front and back cranial, showed the most significant variations. Accordingly two front measures were combined, and two back measures combined. These two groups were correlated separately with the criterion. The coefficients of plus 0.08 and plus 0.12 are interesting and suggestive but not very valuable because of their small size. Judging from them, however, it would seem that the greater the cranial "bulge" in those directions, the greater the lathe aptitude.

The Thurstone "Technical Information" test[2] yielded by far the best results. It was believed that there should be a relationship between a young man's interest and knowledge on the one hand, and his skill in the production of the objects of his interest and knowledge, or of similar objects. It may be argued that manipulative skill leads to an interest in the things used or made, and this interest to knowledge of the facts about them; or perhaps the interest and knowledge stimulate workmanship. Possibly both are true. The test consists of one hundred statements, each relating to a technical subject on which there is more or less popular knowledge. In each statement there are four alternative words of similar nature only one of which, when used, would make the statement true. A few of the possibilities are quite obviously absurd, but most of them require some actual knowledge of the subject to supplement the common sense of the person tested. The subjects were requested to underline the most probable word of the four.

The percentage scores obtained, based on the entire one hundred answers correlated with lathe ability plus 0.39. Inspection of the sheets showed, however, that there was a considerable number of "dead" statements, in that they were too easy or too hard. To eliminate these and other non-significant statements, the writer made use of an entirely different set of data.[3] From this set of data twenty-five of the one hundred

[2] Published by the World Book Company.

[3] The writer is indebted to Mr. Richard Van Tassel of the Psychology Department of the University of Wisconsin, for his use of the Technical Information test scores of seventy-seven subjects, whose criterion grades

statements of the Thurstone test were selected as being significant, after the following fashion: The new (Van Tassel) subjects were arranged in the order of their scoring on the criterion. Their errors on each statement of the Thurston test were then recorded in a check diagram. Thus, the students were arranged in order of criterion rank along the ordinate, and the statements along the abscissa. Then the ranked subjects were divided into three sections, a high, a middle, and a low third. The error totals were then computed for each of the one hundred statements for each of the three sections of students. All statements were then eliminated which did not show a small number of errors in the high section, more in the middle, and most in the lower. This was done on the assumption that no statement could constitute a significant test of comparative *ability unless, when used, the results would show the* inferiors making more errors than the superiors.

TABLE 2

Van Tassel (25 statements selected): Nos.	11, 15,17,18,19,24,
Gleason (30 statements selected): Nos.	6,10, 12,15, 18,19,24,
Van Tassel:	28, 34,35,37, 43,44,46, 50, 51, 62,
Gleason:	26, 32,34, 37,38,40, 44,46,48,50,51,53,56,58,61,62,
Van Tassel:	63,68, 71,74,83,84,85, 88,100
Gleason:	68,69, 74,83,84, 86, 100

The writer's subjects were then regraded on the basis of their performance in the remaining twenty-five statements. Correlation of these new scores with the criterion yielded plus 0.433, *the coefficient adopted. A higher coefficient, plus 0.474 was* obtained previous to this, by using the writer's own data as the basis of selection, but such procedure unjustifiably makes use of favorable chance factors in the tester's data.

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and test scores average practically the same as the writer's subjects. The data are comparable in every respect but obtained from an entirely different group of subjects.

Since the Thurstone test is printed and available for general use it may be worth while to list in parallel rows, the numbers of the statements selected upon the basis, respectively, of Van Tassel's and the writer's subjects (see table 2).

Of the twenty-five statements finally used, sixteen are common to the two groups, and those which are not, are practically all on the borderline of usability. This fact shows that there are distinct possibilities in the method, and argues for its use not alone in the administration, but the construction of such tests as well. It is understood, of course, that the statements selected as significant for this particular criterion are not necessarily so for another type of criterion.

The general conditions under which the tests were given were excellent. Each test was administered by a psychology major who was carefully trained for the task and assisted, where necessary, by another who kept the records. The Technical Information test was given to small groups of the subjects in a separate room, and the individual subjects were advanced, on completion of that test, through the rest of the series of tests, and always in the same order. The attitude of the subjects was excellent, and we had the hearty coöperation of the Engineering instructors.

The means and standard deviations of the variables (tests and criterion) finally selected are shown in table 3.

The zero order and inter-correlations are given in table 4.[4]

The P.E. of each zero order correlation is less than 0.075.

Here, as in Patten's work, the intercorrelations are low—half of them actually negative. And in this investigation, as in Patten's, more than the usual emphasis was placed upon this fact in working up the data.

The next step was to obtain the correlation of each test with the criterion, with the influence of the other tests removed, achieved through partial correlation. (Method outlined by

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[4] All possible intercorrelations of the original data were computed, 80 in all. This work was greatly facilitated both in speed and accuracy by the use of the Hull automatic correlation computing machine, which was put to its first practical test in research work in the course of this investigation. The work was done in the late summer of 1924.

Yule, Introduction to the Theory of Statistics, p. 239; and Rosanow, Analysis of Mental Function p. 39–43.)

TABLE 3

VARIABLE	MEAN	STANDARD DEVIATION	UNIT OF MEASUREMENT
I. Criterion	82.258	5.703	Per cent on work pieces
II. Coördination test, period of time	1.038	0.2735	Minutes
III. Coördination test, diagonal deviation	2.812	1.706	Area in square inches
IV. Box directions, time	4.310	2.278	Minutes
V. Technical Information	14.023	4.531	Number correct, basis 25 items

TABLE 4

		VARIABLES			
		I	II	III	IV
Variables	II	−0.21			
	III	−0.23	−0.15		
	IV	−0.16	+0.163	+0.057	
	V	+0.433	−0.052	−0.275	+0.118

TABLE 5

$r_{12.345}$	−0.202
$r_{13.245}$	−0.16
$r_{14.235}$	−0.19
$r_{15.234}$	+0.413

The highest order of partials is shown in table 5.

A comparison of the above with the zero order coefficients shows a remarkably small shrinkage, which indicates how completely each test taps a separate constituent of lathe aptitude.

The coefficient of total correlation (R) was then derived and checked (by Rosanow's methods, op. cit., p. 40). The coefficients arrived at via two routes, i.e., using two sets of partials, were 0.527 and 0.524, the slight discrepancy undoubtedly due to dropping decimals. These coefficients serve as a check upon the accuracy of the partialling and give us a useful means of expressing the total prognostic value of the tests. This is seen to be slightly (three points) lower than was obtained by Patten.

As yet the assemblage of tests cannot be considered a battery since the varying sizes of the zero order coefficients certainly points to the necessity of giving the tests widely different weightings. To this end the formulae given by Yule (op. cit., pp. 237–244) were employed, which, when worked out in detail, gave the following regression equation or forecasting formula:

$$X_1 = 34.196 - 3.782\,X_2 - 0.4958\,X_3 - 0.424\,X_4 + 0.5114\,X_5$$

In making a prediction, X_1 represents the unknown probable grade in the lathe work, of any given student, or, if you like, the probable aptitude of an applicant for a position of that nature. X_2, X_3, X_4, and X_5 represent, respectively, the raw scores of the individual in the tests of those numbers. Substitute these raw scores for the X's and solve for $\bar{X}_1$.

As a test of the accuracy of the computation throughout, the substitutions were made by the writer for each of the seventy-seven subjects of the experiment and the estimated criterion scores thus secured were correlated with the original criterion. If there were no errors, and no shrinkage due to dropping of the decimals, the check coefficient should equal that for total correlation (here, 0.527). The check coefficient found was approximately 0.50, which was deemed sufficiently close to guarantee the general accuracy of the arithmetic.

The fact that of the seventy-seven predictions made, thirty-nine fall within three points of the actual scores, while ten are identical, serves as a rough indication of the value of the tests. Their forecasting efficiency may also be expressed in terms of percentage, the figure being determined by the use of the formula:[5]

$$E = 1 - \sqrt{1 - r^2}$$

An R of 0.50 yields a forecasting efficiency of 13.4 per cent, which compares fairly well with most tests of special aptitude.

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[5] For details and explanation of this formula see article by Drs. Hull and Limp in Journal of Educational Psychology, February, 1924.

THE MEASUREMENT OF PERSISTENCE

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STATEMENT OF THE PROBLEM

It is recognized that the possession of a trait which is commonly called persistence may enable a person who may have deficient intellectual ability to succeed whereas one who has ability and lacks persistence may fail. The trait which is represented by this term is recognized but as yet we have not been able to give it a specific evaluation. The experiment to be reported in this paper is an attempt to formulate a clear-cut concept of persistence and to develop a means of measuring it in its varying degrees.

Persistence is a mental attitude which arises as the result of a definite environmental situation. The stimulus to persistence is some situation that would tend to hinder the free unfolding of a course either begun or planned by an individual and the attitude of persistence indicates a reaction of pugnacity toward this thwarting situation. This attitude is probably a conditioned response.[1] It might be defined as that attitude which drives a person, once he has undertaken a task, to complete it to his satisfaction.

We may state this in another way. When thwarting decreases the neuro-muscular tension of an individual we call that individual non-persistent. When thwarting increases the neuro-muscular tension of a person we say he is persistent.

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[1] For an explanation of how such an attitude might be conditioned, see: Morgan, John J. B., The Psychology of the Unadjusted School Child, Macmillan, 1924, p. 66.

The measuring of this trait involves the creation of an experimental situation which must have certain specific factors which grow out of an analysis of the trait and its development.

1. The subject must be given some feeling of familiarity with the task involved. One does not persist in a totally new task for the simple reason that he has no means of evaluating the possible magnitude of the difficulty.

2. He must have experienced some success in the task. Persistence is an outgrowth of the habit of success. Hence, it is absolutely essential that the individual experience success in the type of work involved in the test in order to measure how strenuously he reacts against thwarting in that same sort of work.

3. Training in success should involve the overcoming of increasingly greater difficulties.

4. The final task must be difficult enough to thwart the most persistent person.

5. There must be some scale by means of which the varying reactions may be evaluated. Most of our test measures are in terms of degrees of achievement or the time taken to attain the same degree of achievement. Since persistence is only indicated by the subject's reaction when achievement is withheld it is obvious that the first cannot be used in a test of this sort. In a previous experiment[2] with the same apparatus, time was used as a measure, but seemed inadequate.

DESCRIPTION OF THE TEST

The apparatus used in the test was a maze constructed according to the plan indicated in the diagram. The paths were grooves cut into a maple board. The places marked A, B and C on the maze were holes so that when the subject, tracing through the maze with a stylus, came to one of these holes his stylus would drop into the hole. During the test the maze is covered with a cardboard through which the stylus is inserted. Enough of the maze is visible around the stylus to indicate the nature of the turning places but not enough to enable him to see from one alley to any adjoining alley. He knows when he has solved any particular problem by the fact that his stylus drops into a hole.

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[2] Loc. cit., p. 68.

An outstanding feature of this maze is that it can be arranged to furnish different problems of increasing difficulty. This is done by inserting blocks in different alleys, thus cutting off parts of the maze. The problems used were as follows:

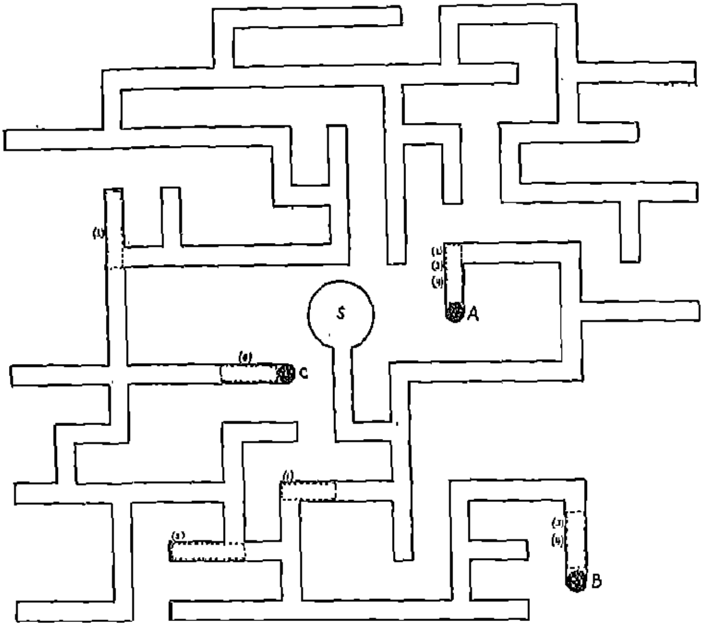

Fig. 1

1. A block as indicated by the dotted lines is inserted at point marked (*1*) on the diagram. This cuts off the greater part of the maze and the solution of this one is very easy. Hole *A* is open.

2. Blocks are inserted at the two places marked (*2*). Somewhat less of the maze is closed. Hole *A* is closed and a solution means finding *B*. This is then a new problem with a different and more difficult solution than the first problem.

3. Blocks are inserted at the three places marked (*3*). The holes *A* and *B* are both cut off and a solution involves more tracing and the location of a new hole, *C*.

4. Blocks are inserted at the three places marked (*4*). These three blocks cut off all three holes, *A*, *B*, and *C*. The solution of this maze is impossible.

PROCEDURE

The subject is seated in a comfortable position with the board, already prepared for the first test, covered with the cardboard, and with the stylus inserted at the round alley (*S*) in the middle of the board, on a table in front of him. The experimenter then says: "You see these little alleys that the stylus can travel through? You take this stylus and trace through until it drops into a hole, see, this way." The experimenter traces to the first turn and then says, "This first test is very easy, but, you see, here you can go two ways. You must choose which way to go. If the stylus does not drop into a hole, come back and try the other way. When you find the hole, tell me and I will open up more of the board for you."

Tests two, three and four are given in succession. When the experimenter opens up the board for the fourth test he should say, "Now you have practically the whole board to work on." While working the subject may say, "You must have put these pegs in wrong." If he insists the experimenter may make an examination, but it is best for him to say nothing. The subject may ask directly, "Do you know there is a hole here?" In answer simply smile. Let him interpret as he pleases.

Usually the smile is sufficient but if the subject should continually ask questions in an effort to get a pointer the experimenter may say, "I am not supposed to talk while you are taking the test." This is merely a statement of the attitude that has been preserved throughout the test, and serves to impress the subject with the worth of the test.

In giving the test the experimenter watches the manner in which the subject works and he can readily place him in one of the following nine groups:

1. Careless-anxious to quit a task.
2. Excuse hunter—always has an excuse to get out of work—feels badly, eyes hurt, time valuable, etc.
3. Fiddling plodder—keeps working because he has not enough initiative to try harder or quit, follows line of least resistance.
4. Intermittent worker—goes by spurts, working hard and then has periods of fiddling.
5. Works hard, but has little insight—(really persistent, but not intelligent).
6. Persistent worker with some method or definite attempt to accomplish aim.
7. Persistent worker with some attempt at insight but easily convinced. Probably tries out two or three methods.
8. Tenacious, obstinate type—more determined to succeed because of obstacles.
9. Analytical type—intelligently persistent to the extent that he fully analyzes the problem. Presents data well worked out to prove his conclusions.

This scale is qualitative but the distinctions between the grades are clear cut and the working on the maze brings out the different types in a very pronounced manner. In another study we are planning to work out the degree to which different observers agree in their application of the scale.

If a subject has worked a long time, the experimenter may say, "Do not work longer than you wish. If you can't find the hole, and do not care to try longer, you do not need to." A student of grade 8 type will usually work an hour or more, depending on the amount of time you have asked him to give. He will usually ask permission to work at another time. He is not yet satisfied with his work. After thinking it over, however, he does not return. One of grade 9 will return until he has mastered the test, by proving that it cannot be solved.

THE EXPERIMENT

Three separate judges were given the task of rating one hundred persons according to the scale given above. Their ratings were based on their personal observations of each of the hundred.

Three senior students were chosen to act as judges. They were superior students who had time for work outside of their regular classes and were in their second year of teacher training, having studied psychology and pedagogy, in which courses considerable attention had been given to analyzing character traits. The nature of the work was carefully explained to them. They understood that an attempt was being made to see whether the maze test would measure the persistence of an individual, and that this would be decided by correlating the test ratings with their ratings.

Working absolutely independently each of them took the list of 100 students and carefully rated them by placing them in one of the nine groups specified on the rating sheet described above. After they had completed their ratings the twenty best and the twenty poorest individuals as determined by the average ratings of the three judges were given the maze test.

RESULTS

1. The rating sheet was an important factor in the ratings made by the three judges. A preliminary attempt to get judges to rate persistence without the help of the sheet in the final form presented in this paper gave a correlation between the judges of 0.304 ± 0.094. The correlations between the ratings of the three judges reported in this paper were as follows:

Judge 1 with judge 2	0.576 ± 0.045
Judge 1 with judge 3	0.646 ± 0.039
Judge 2 with judge 3	0.584 ± 0.044

2. Since there was such a close correlation between the ratings of the three judges it is quite probable that the selection of the lowest twenty and the highest twenty according to their combined ratings gave groups that were reliably different. The average combined rating for the lower group was 3.32 with a standard deviation of 0.92. The average combined rating for the upper group was 7.47 with a standard deviation of 0.54. The difference between the two groups was 4.14 points with a probable error of the difference of 0.163. Since the difference is 25 times the probable error of the difference it is quite evident that as far as the judge's ratings go these two groups were reliably different.

3. Having these two selected groups the question that we wished to answer was: "Will our test sort these individials out in as reliable manner as our ratings did?" Our experiment gave a definite answer to this question.

The average rating of the poor group on the test was 2.9 with a standard deviation of 1.12, while the average rating of the high group on the test was 6.65 with a standard deviation of 1.24. The difference between these two averages is 3.75 while the probable error of the difference is 0.25. The difference is 15 times the probable error of the difference. There was a slight tendency for the judges to rate them higher than the test results. Otherwise it is evident that the test sorted them out with almost as great precision as the judges' ratings.

4. In order to determine more precisely the relation between the ratings of the judges and the ratings on the test correlations were computed based on the forty cases used in the experiment. Of course a correlation based on individuals on the extremes of a scale, as our groups were, will give a fictitiously high correlation but such correlations will enable us to compare the closeness of relation if we remember that the absolute value of the correlations is not significant.

	JUDGE 1	JUDGE 2	JUDGE 3
Test	0.838	0.723	0.834
Judge 1		0.807	0.832
Judge 2			0.849

The correlations are about 0.20 higher than are the correlations between the different judges as shown under 1; hence it is likely that the correlations that we would have gotten had we tested the whole group would have ranged about 0.20 below those found by using only the extreme cases for our experiment. The correlation of the test with the combined rating of the judges was 0.842. The probable errors of the above correlations range between 0.03 and 0.05. With the exception of the correlation of the test with judge 2, the test has as close a relation to the individual judgments as the judgments have to each other. In the complete correlations given in 1 we see that judges one and three agree with each other more nearly than either do with judge two. Two is the erratic judge and this may account in part for the fact that his correlation with the test is lower.

SUMMARY AND CONCLUSIONS

Three judges were given the task of rating 100 pupils according to their estimates of where they fell in a definite scale of persistence which was provided them. The twenty highest and twenty lowest were then rated by the same scale but in a definite standard situation designed to bring out the trait of persistence. This persistence stimulus was an alley maze with more and more difficult problems given in succession, ending in an impossible one.

It was found that one can rate a stranger on this scale as accurately as this same person can be rated by an intimate personal acquaintance on the basis of repeated observations.

Our progress in the measurement of many mental factors has been retarded by an over-emphasis on records of quantity and quality of work produced per unit of time. Persistence seems to be a trait that cannot be measured in the traditional manner. *For this reason emphasis was placed on the creation* of a situation that would produce an expression of the trait, even though we had to use a qualitative measure of performance.

THE CLASSIFICATION OF MENTAL DEFICIENTS (ESPECIALLY OF GIRLS) FOR A SPECIAL CLASS CENTER

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As changes have come about in the aims of education, the process of classification of school children has taken a synthetic turn. The child and his capabilities are studied. Possible futures are being explored. The closer capabilities and possible futures can be linked up the greater will be social progress and happiness.

Mental deficients is a term used here to designate the pupils found in the public schools who are so mentally and educationally below par that they do not give promise of advancing far beyond the standards of the primary grades; still they may be partially, if not wholly, self-supporting in their later lives. The term is used in a purposed attempt to do away with the use in this connection of the term "feebleminded" with its varied and stigmatic interpretations. Even the word "deficient" carries an implication of inability to function which cannot properly, and should not be, applied to a human being until after life has given the try-out. A better term, one without a trace of implied stigma is awaited.

The term *special classes* has reference here to classes for those whose intelligence quotients range from 50 to a possible 90. It is a fairly well established fact that those whose intelligence quotients fall much below 50 are ordinarily safer under the protection of the institution. Records of the State School for the Feebleminded at Waverley, Massachusetts, show that "institutional" cases reach the institution sooner if refused admission to the special class or to the graded school. An "institutional" case, if protected in special classes until he is beyond school age, becomes at the time of discharge a serious menace to himself and a difficult problem for society. Until classification is more carefully and scientifically worked out, the special classes, if their pupils are properly classified, can care for certain pupils with intelligence quotients of between 80 and 90 much better than the grade classes. Eventually clinic classes may better meet the need of the 80 to 90 cases; *then the special classes will care for the cases with IQ's* of from 50 to 80. The line of demarcation at either end of the scale should be most elastic when applied to individual cases. The intelligence quotients of the 90 special class children of this Boston study show a range of from 43 to 83. Eighty-eight per cent of the quotients fall between 50 and 83.

A *center* is interpreted here as a group of classes, largely of adolescents, whose teachers and pupils are working together coöperatively for the uplift of the group and of each individual in the group.

With the present conception of the kinds of training which are of value to pupils of such a center, three classes would be the smallest number that could coöperate in this way. Authorities differ as to the most desirable number in each class. From my own experience, it would seem that a teacher in a well organized center can work as advantageously with 18 to 20 pupils, as a teacher with a less carefully selected group can work with 12 to 15. As the number of classes is increased within a center beyond 6 or 7, the intimate contact of each child with the leader of the center is lessened. This means much more to the mentally deficient than to the normal child.

The following, then, is a study of the methods and results of the grouping of adolescent girls whose intelligence quotients lie between 50 and 90, in a small, centrally located school, where pupils enjoy, share in, and profit by experiences which promise to prove valuable to them in the emergencies of later life.

On April 2, 1924, the following questionnaire was sent to Superintendents of Schools or Heads of Measurement Departments in 141 cities in the United States. (The 141 cities were selected from those listed by the United States Bureau of

Education[1] as conducting special classes for retarded or backward or mentally deficient pupils.)

1. How many Special Class Centers for the Mentally Retarded or Deficient have you? (A Center meaning three or more classes grouped and working together.)
   Number of classes in each Center?
   Sexes, and range of ages of pupils?
   Nationalities?
2. Who chooses the pupils for a Center?
3. What is the process?
4. Are mental tests given? If so, what tests? And who gives them?
5. What are the findings from the data obtained from such tests?
6. Are printed reports available?
7. What types of pupils are admitted to a Center?
8. What types are rejected?
9. On what bases are classes within a Center divided?
10. Do you know of other Centers organized since 1922? Who is in charge of them?

Replies, very carefully worked out, were returned from 114 cities. The summary of the replies follows.

Question 1. In 48 cities, 140 centers were located. Of these centers 12 reported having more than 6 classes. The median number of classes in a center was 5. There are not as many centers for girls only as for boys, or for both boys and girls. The ages of pupils parallel the compulsory school age. There are very few American children in the classes. The foreigners are such as the location of the cities implies.

Question 2. Trained supervisors select the cases in 20 cities, psychologists or trained clinicians in 19, state examiners in 5, principals or untrained teachers in 4.

Question 3. The grade teacher, principal, school nurse or social worker first notes the backwardness. Wherever clinics are available pupils are referred to them or to a psychologist.

Question 4. Thirty-six of 48 cities report the use of or reliance upon some form of Binet-Simon Individual Intelligence

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[1] Schools and Classes for Feeble-Minded and Subnormal Children. Bulletin No. 59, 1923. Published in 1924 for the Department of the Interior, Bureau of Education, Washington, D. C.

Tests. Reports from clinics show that the usual clinical procedures are followed, batteries of tests being given to each case.

Question 5. Only leading cities have made deductions from data on file.

Question 6. Very little printed matter on the subject is available. Busy workers on the problem have as yet done little writing.

Questions 7 and 8. The types of cases admitted and rejected are greatly influenced by legislation. Only 8 of 48 cities report refusal of admission to cases with IQ's below 50. Four cities frankly admit that they enter all cases that come, regardless of MA's or IQ's. Cities with strong clinics report definite limitations of 50 to 80 or 85 IQ's.

Question 9. All agree that mental age and intelligence quotient, even plus academic ability, are not criteria enough for classification. There is an emotional, or social reaction that needs more study and interpretation. The late Dr. Walter E. Fernald wrote, under date of April 29, 1924: "Most of our plans . . . . are based upon psychological findings, plus the personality and character study, plus the patient's home and other environments, etc. Every individual is a new one and his needs are just as individual." Dr. Arnold L. Gesell of the Yale Psychological Clinic writes: "The factor of vocational capacity and capacity to make social adjustments are of special importance with respect to classification."

Question 10. A large number of centers are struggling along without knowledge of what others have done or are doing.

The fact that authorities differ on such subjects as Segregation of the Mentally Deficient in Special Classes, Maximum and Minimum Curriculum, Admission Requirements for Junior High School, is evidence again of progressive thought on individual differences and individual aptitudes, and emphasizes the great value to normal individuals of studies and work on the problems presented by the mentally deficient.

On October 1, 1924, a tally was made of the sources from which 1875 pupils entered Boston Special Classes. The pupils are the population of 96 classes, including four centers.

From Grade I came 27 per cent of the cases; from Grade II, 30 per cent; from Grade III, 17 per cent; from Grade IV, 10 per cent. The remaining 16 per cent were from eleven other sources.

From much observation of placings in special classes from Grades II and III, it appears that most of the cases were probably recognized in Grade I, but were left in graded school at a parent's request. (Massachusetts law endorses parental authority in such matters.)

Terman writes: "Children are sent to school not when they are mature enough to learn what is taught, but when they have lived six times three hundred and sixty-five days."[2] As long as this is true of our American public schools, Grade I must continue to contribute the major share of candidates for special classes. Chronological age is not the best criterion of readiness to begin a school career.

Scientific diagnosis of abilities should be made at the time of entrance to Grade I. This diagnosis should be followed by immediate and authoritative placing. Parents should know and appreciate the meaning of early diagnosis.

The school[3] studied is located in the geographical center of five Boston school districts and is easily reached by electric cars from all parts of the city. The over-age children of the immediate district were carefully tested in January, 1913, by the Goddard Binet-Simon Test; 3.7 per cent of these over-age children proved to be three years or more retarded. From the retards were selected the youngest, enough for two classes. Neighboring districts contributed to another class. Three more classes were made up of pupils from any and all parts of the city. Sexes were not separated.

The pupils of the six classes were then graded according to mental age, and grouped within classes according to intelligence quotient. This grouping, although not satisfactory, continued until 1915 when it seemed best for purposes of appropriate handwork to separate the sexes. The boys became the nucleus of a boys' center, and girls from distant districts filled the vacancies. The total number of girls was kept at 90, the capacity of the building.

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[2] Terman, Lewis M. The possibilities and limitations of training. Journal of Educational Research, vol. X, no. 5, December, 1924.

[3] Frances E. Willard School, Boston.

There were great differences in ability between the twelve-year-old girl with a mental age of eight, who had sat in grade classrooms up to the fourth grade, and the twelve-year-old girl who had enjoyed fewer years in grade school and several years in a special class. Differentiations for training was necessary. Today very few girls enter the center directly from a graded school. Most of the candidates have been pupils in a single special class. *Any twelve-year-old girl, pupil of a Boston* special class, becomes automatically a candidate for the girls' center, though there may be good reasons which will prevent her entering the center.

Some criterion other than mental age and intelligence quotient was needed for making group divisions within the center. The healthy, overgrown girl of fourteen with a mental age of eight was as much out-of-place with younger girls whose mentality was eight, and with whom she could compete in academic and hand tasks, as she had been in the graded school. At once the problem resolved itself into a perpetual study of individual differences, individual needs, and individual placing.

When a new girl enters today she is placed in as low a class as her record makes it seem possible for her to profitably work, —in a class where she *can do* the work. This gives at once the necessary success basis, and she sees the added opportunity of several promotions ahead before she must leave the highest class when she is sixteen years of age.

The following study for purposes of classification within the center was made between January 15, 1925, and February 18, 1925. A complete study should cover physical, mental and social conditions for each child. This study omits physical diagnosis, though it does not minimize its basic importance. It is hoped that diagnoses now being made at the Boston Homeopathic Hospital Posture Clinic will yield valuable data on matters physical.

A study of the birthplaces and parentage of the 90 girls yields these facts:

Of 67 white children, 59 were born in the United States, 4 in Italy, and 4 in other European countries. All of the 23 colored children were born in America.

Of 67 fathers of white children, 18 were born in the United States, 22 in Italy, 5 in Ireland, 5 in Russia, 17 in other European countries.

Of 67 mothers of white children, 14 were born in the United States, 23 in Italy, 8 in Ireland, 5 in Russia, 17 in other European countries.

With the exception of one colored father and mother, born in England, all of the colored parents were born in the United States.

Only one child is an American of the third generation. In only three cases could mixing of nationalities be traced. Of the 59 white girls born in the United States, 51 bear names that give distinct evidence of their foreign origin.

The range of chronological ages is from 8 to 16 years. The median age is 14.5 years.

The range of the number of years the girls have been actually present in the classroom is from 1 to 11.5. The median time is 6.3 years.

The ages of many of the girls were falsely entered in Kindergarten. This alone may be a fertile source of retardation. Now birth certificates are required at entrance to school.

The low record of some girls is due to poor attendance. This is often not the fault of the girl but of her foreign parent who values a little scrubbing at home more than she does the education of her child.

A striking criticism of past classifications and of inelasticity of curricula appears, when one finds among these girls those who have been in actual attendance in school 10, 11 and 11½ years, and today have only second and third grade academic ability. They all have other abilities which, no doubt, might have been better fostered had the girls been properly placed as soon as they were recognized as academic retards. Although special classes, and especially properly equipped centers, are very expensive, states are bearing expensive social burdens because of improperly placed retards.

Eighty-four of the 90 girls live in congested quarters. Families are large. Italian girls are living in the most crowded quarters. One Italian girl is one of ten who live in four rooms. Another is one of eleven who live in four rooms.

Splendid results of social service work appear when one studies the recreations of the children. Comparatively few of the girls play on the streets. With two exceptions, the parents welcome playmates to the home, where games are played, the graphophone entertains, and where even fudge is made. Many of the girls belong to gymnasium or dancing classes, or to clubs, connected with the Settlement Houses or with Church.

The moving pictures are the greatest outside attraction.

Of 83 girls, 70 attend moving pictures once a week, 8 twice, 4 three times, and 1 four times.

Fifty-five of 71 girls go to bed regularly by nine o'clock. Italian girls are kept up late by the late frolics of the guests of older members of the family. This may explain the fact that nearly all of the tardy marks of the school are made by Italian girls.

A test, using Haggerty Intelligence Examination, Deltas 1 and 2, proved unsatisfactory because of a seeming overlapping of the tests. However, each girl whose scores were at great variance, is an active, unstable, neurotic type of girl. One is hard of hearing. The general inability of the girls to interpret the printed page makes some of these tests unsatisfactory for these particular girls.

From the tests recommended as valuable by the various clinics, in answer to the questionnaire, four group tests were chosen, none of which presupposes the ability to read. The first given was the Dearborn Group Test of Intelligence, Series I, Examination A. Maximum score is 202. Scores ranged from 22 to 176, with the median at 109.

The second test was the Pressey Mental Survey, Primer Scale. Maximum score is 100. Scores ranged from 14 to 87, with the median at 60.

The third test was the Pintner-Cunningham Primary Mental Test. Maximum score is 59. Scores ranged from 22.5 to 55 with the median at 43.5. In the distribution of these scores most of the frequencies were 1 or 2; the largest being 6. It would seem that this is another proof that individual test and individual adjustment is necessary for intelligent classification of this group of girls.

The fourth test was the Otis Group Intelligence Scale, Primary Examination. Maximum score is 85. The scores ranged from 13 to 79, with the median at 51.5.

Every child apparently put forth her very best effort on every test. All enjoyed it thoroughly. The best work was done on tests to which there was some "carry-over" from training given in the special classes. Surprisingly few failed on the time-telling test of the Dearborn Tests. Test III of the Pressey Scale, the "Form Board Test," was perfectly done as far as time permitted. A few did not finish within the time. Test 5 of the Pintner-Cunningham Test was exceptionally successful. This is the one in which similar parts of a picture are identified. Those who did not do well on this are the over-imaginative, story-telling, or seemingly untruthful girls. The Association Test of the Otis Intelligence Scale was perfectly done by 68 of the 71 tested. For most, it was the only perfect page of the test.

As a whole these group tests do not give satisfactory ratings for the higher grade cases, nor for neurotic cases. For the steady, plodding cases, the results of group tests and of Stanford Revision of the Binet-Simon correlate highly. Even the Stanford Revision of the Binet-Simon Tests is not always dependable for accurate testing of these girls, as that test involves a certain amount of reading ability.

The general conclusion from the testing of this group of girls is that mental testing throws a great deal of light on the cases and is, therefore, a most helpful tool. It is far from being the only criterion for deciding problems of classification.

Academic measurement of the girls brought out great shortages. Courtis Arithmetic Tests, Series B, Form 1, were given to 65 girls. An observer, unfamiliar with the imperfect correlations of effort and accomplishment, would have expected perfect results from this test. Every girl apparently gave her whole heart and soul to the work. Sixty-one rated below Grade III, 3 at Grade III, and 1 at Grade IV. Eight reached Grade III in Addition only.

As the oldest group of 16 girls was known to contain several of the school's best readers, the Thorndike-McCall Scale for Sentence Interpretation was given to them. The makers of the test state that a score of 55 marks "exceptionally low reading ability." The scores ranged from 0 to 53.

Five teachers pooled their estimates of the reading grade of the 28 best readers. The estimates were based upon the ability to read aloud, with seeming intelligence, sentences chosen from standard text books for graded schools. Then these 28 girls were rated by the Thorndike-McCall Scale for Sentence Interpretation.

Eight cases of the 28 agreed with the teachers' estimates.

Fifteen cases were over-estimated by the teacher.

Five cases were under-estimated by the teacher.

Of the 15 over-estimated, 8 were over-estimated by one grade, 7 by two grades.

The 5 under-estimated were under-estimated by one grade.

The girls whose ability was over-estimated are active girls, of intelligent appearance, who have learned to automatically pronounce words correctly. The girls who were under-rated are passive, quiet girls of less attractive appearance. The single exception to the two statements above is the case of an unattractive girl of second grade ability who appears to read aloud as well as any child of Grade V. She seldom has any idea of content.

In Handwriting, 90 girls came nearest to normal scoring. In the ratings, by the Ayres' Scale, for quality, the range was from 20 to 70, with a median of 56.6—only 3.4 short of the 60 required for "excuse from further practice."

Speed in handwriting ranged from 13 to 101 words per minute, with a median of 75. Sixty is counted a fair median for speed.

In Spelling, tested by the Ayers' Scale, the scores ranged from 0 to Grade V, with a median of Grade III.

No attempt was made to test language. Teachers' ratings range from 0 to Grade 2A. Seventy-five of the 90 girls use a foreign language at home. The remaining 15 seldom hear even fair English outside of school hours.

The following fifteen questions were selected as a basis for a social rating of each of the 90 girls:

To what extent does she

1. Respond to directions without waste of time?
2. Persevere?
3. Get along with her mates?
4. Confess wrong doings and make amends?
5. Tell the truth?
6. Stand for fairness, and play the part of a good loser?
7. Refrain from copying the work of others?
8. Show respect for property and people?
9. Give help to other children?
10. Show cleanliness in habits of person, dress, and speech?
11. Provide herself with necessary materials, keeping same, together with books, desk, and work in good condition?
12. Await her turn, avoid interrupting, remember the little courtesies, "Please excuse me," "I thank you," etc.?
13. Maintain a good standing, sitting, and walking posture?
14. Exercise self-control in keeping her temper, avoiding quarrels, refraining from sulking?
15. Practice habits of thrift in the use of money, paper, pencils, etc.?

The ratings were the medians of the ratings of six teachers. 100 represented a perfect score. The scores ranged from 23 to 100, with a median of 61.6. It is of interest to note that the 100 score was made by one of the girls with a low IQ.

The social ratings obtained by this crude scale do correlate positively with intelligence quotients obtained from the use of the Stanford Revision of the Binet-Simon Individual Intelligence Tests. The coefficient of correlation (Pearson formula) is +0.326.

The girls whose social ratings are far below their IQ's are the ones who are the misfits everywhere, the ones to whom the special class has not yet been able to make successful appeal. The girls whose social ratings are higher than their IQ's are the center leaders. This shows very plainly in the complete set of psychographs which has been made from this study.

The graduates of the school who are now doing well at their work are those whose social ratings are high. Many a pupil with low IQ and high social rating is succeeding, while her schoolmate with a comparatively high IQ and low social rating is failing. Certain it is that the factors which make for social competency and social success offer a great field for research.

The present groups of the center, though skewed from the original MA and IQ classification, are homogeneous socially. There is much class spirit and much loyalty to the school and to its teachers. The curriculum is elastic enough to permit any girl to leave her class to fill an order for a cake, to help another girl repair her coat, to make a hat, to adjust a skirt hem, to darn a stocking or sew on a button, to fill a hot water bottle for a sick mate, to dye material for a dress, to help to scrub a floor, or to do any of the numberless pieces of practical work that need to be done where 90 girls live together.

The girls can use their hands for many kinds of useful work; and, accordingly, they are given opportunity for work in Plain Sewing, Embroidery, Dress-making, Millinery, Knitting, Crocheting, Weaving on large, old-fashioned looms, Bead-work, Paper Favor- and Flower-making, Drawing and Painting, Box-making, and Simple Book-binding. Each girl is encouraged to work for skill in the line in which she works best. Sixty-three of the 88 girls scored by handwork teachers, rank "good" or above. During the past year, over three hundred dollars worth of dresses, hats, underwear, and fancy articles were made and sold at cost prices. The money was re-invested in more materials. The workmanship compared favorably with that done at a Trade School. The handwork is all done under sympathetic, trained leadership. Perhaps some of the lack of success in life of a few former pupils may be traced to the lack of the right kind of leadership out in the world. Within the last five years great gain has been made at this point, through the employment by school departments of "follow-up" teachers, who help the employer to understand the conditions, and help the child to see the importance of staying at her work through seeming vicissitudes. It is wisest for the present to insist, however, that the girl, upon leaving school to go to work, find her own job. The very fact that the finding of employment is difficult, and that the girl is thrown entirely upon her own resources, helps her to cling more tenaciously to the work when she finds an acceptable place.

Each girl in the school has a lesson on cookery and one in housekeeping each week. The lessons last for an hour and a half, and are conducted by a trained teacher of domestic science. In this department are made the closest contacts with life's measurements. The food must be palatable and ready on time. The dishes must be found clean and in their proper places. The room must be tidy. Much of the work is known to carry over directly into the home.

Lunches are cooked and served at cost at the school each day for from 60 to 75 pupils and 6 teachers. Pupils of the oldest classes in groups of four, in turn, prepare the lunches. All classes take turns, for a week at a time, in clearing up the room after lunch. The work parallels the work done in domestic science in the graded schools with but few exceptions. Special class girls fail on tasks requiring academic ability. They do not, as a rule, copy recipes correctly. They are seldom sure of measures. They must be supervised at just the right moment in just the right way. Few girls can purchase materials, make and frost a cake, without a little help. Nevertheless the school has a reputation abroad for its "splendid cakes." The reputation finds its source in the psychology of the mentally deficient. The thorough beating of the ingredients is basic for successful cake making. Deficient girls are happy when they can use the egg-beaters, and will beat tirelessly until told to stop. The teacher's part is the giving of the "stop" signal, followed by the next simple direction, at just the right time. Surely mental deficients have a place of real worth in the world, if it be no higher in the scale than beating cakes.

Included in the study are psychographs of each girl, showing her Chronological Age, IQ, School Grade for present CA, School Grades in Arithmetic, Reading, Spelling, Writing, Handwork, Cooking and Housekeeping, and a Social Rating. The value of the graphs will develop with repetition of tests at regular intervals.

A study of the placing of 321 girls discharged from the school in the past twelve years shows that fewer criminal cases and fewer institutional cases appear in the classes than formerly; fewer are returned to grades because of parental unrest. More *and more are the graduates employed in factory, or remain at* home to work while others of the family earn the daily bread.

This confirms a statement made by the late Dr. Fernald in a lecture before the Boston Special Class Teachers on October 3, 1924: "More and more are the special classes keeping out of the institution the morons who have ability to do some useful, real work worth a wage."

In an attempt to locate 101 of these factory and home workers, 31 were found in factory earning from $7 to $18 a week. Many, especially the colored girls, are unemployed. Of the 21 found at home only 6 have really done well there. The home supervision is often lax, and suffering and disease have crept in. These home girls are the low grade girls. More institution room might relieve this situation.

This is Dr. Fernald's thought: "In order that the mentally handicapped may be an asset and not a liability, early diagnosis, appropriate training, kindly social supervision are imperative; and the organization of the requisite provisions for these three activities devolves on the state and on the community at large."[4]

Early diagnosis is already possible. Great advances are being made in making the training appropriate. Practical work on social supervision of special class pupils after leaving school is still in its infancy. The next step beyond the work of "Centers" will undoubtedly be some kind of "actual work" or "shop" schools for girls and for boys, where those with capable hands can be more practically tried out at the different lines of work which "follow-up" shows are the actual lines of real life activities. Classification is basic at each and every step.

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[4] Boston Medical and Surgical Journal, vol. 192, no. 2, pp. 94-96, January 8, 1925.

AN INFORMATION TEST APPLIED TO JUVENILE DELINQUENTS[1]

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One of the most frequent and valid objections to the Binet Scale in its several revisions is that it does not measure social efficiency, the lack of which is extremely important in mental diagnosis in detecting the potential social inefficient. Very often the recommendation, especially in cases of borderline intelligence, of all diagnostic levels the most uncertain, depends upon the degree of social fitness and estimated industrial capacity. An inquiry by means of a questionnaire covering allopsychic reactions is a rapid but effective method of supplementing the Binet Scale in this respect and in aiding the examiner in his recommendation. On the Stanford revision there is no test item which is definitely reliable in furnishing a knowledge of the subject's awareness of his relation to his environment above year IX. That orientation has a very direct bearing upon the social efficiency of the individual is a matter of common acceptance; in some cases of cursory or preliminary examination or for confirmatory evidence it is the only method employed. By the layman, its lack in an appreciable degree is regarded as almost an undisputed criterion of an unintelligent being. The use of the Ten Point Scale of Psychopathy[2] in many clinics involves the determination of orientation as an aid in disclosing the psychopathic function. To this end, desiring an instrument of sufficient range to lend interpretation to variations in score, the director of the Wayne County Psychopathic Clinic,[3] with the collaboration of her staff, devised an Information Test of 100 questions to be applied to individuals above eight years of age, and the study herewith presented is an analysis of the results of the first 300 such tests given to unselected patients. Such a test, intended to be applicable to all ages and to people of varying educational attainments, is necessarily of local interest in its subject matter; however, in statistical analysis and interpretation of results there are no geographical limitations for in these its interest ceases to be wholly local.

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[1] Submitted and accepted in partial fulfillment of the requirements for Graduate credit in Applied Psychology.

[2] Florence Mateer, Ph.D., Journal of Delinquency, Vol. VI. No. 1, January, 1914.

The test consists of 100 questions, requiring about ten minutes time for its administration, each item of which is assigned an arbitrary scoring value of one point. It is reproduced in original form at the conclusion of this article, the more recent changes being omitted inasmuch as they are not included in this study of the first 300 cases to whom it was given.

The chronological ages of the subjects and the corresponding scores are given in table 1 following the general plan of a twofold grouping, those whose IQ's were above 80, numbering 132 cases, and those whose IQ's were below 80, numbering 168 cases; in the former group there were 50 boys and 82 girls, in the latter, 69 boys and 99 girls. In each group there were several cases whose chronological age would place them in an adult classification, but because there were so few of them they were considered under one comprehensive category, designated as "above 16." This table shows a disparity between the median scores of the two groups which is never closer than 11 points for those whose chronological age is above 16, and varying 34 points in years 9 and 11. The general tendency is for the variance to become less as the chronological age increases and we may thus conclude that a deficiency in orientation and general information tends to lessen in proportion to the intellectual defect; that is, a child whose IQ is below 80 at nine years of age will have an information test score 34 points below that of a normal child of similar age, but when the two have attained the age of 17 there will be but 11 points difference in their scores, theoretically.

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[3] Dr. Nellie L. Perkins.

MENTAL AGE VERSUS SCORE

The mental ages of the higher group range from 7 to 17 years, the median being between 12 and 13 and the median score 87. The median score of the inferior group is 63 and the median mental age between 8 and 9, range 6 to 12.9 years. The consistent relationship between mental age and information test score is shown in tables 2 and 3 in which the median scores by year groups are progressively lower as the mental age decreases.

TABLE 1

I.Q.'s above 80			I.Q.'s below 80		
Chronological age	Score	Number of cases	Chronological age	Score	Number of cases
Above 16	94	7	Above 16	83	9
16	94	17	16	74	27
15	93	30	15	71	41
14	89	18	14	70	37
13	84	24	13	58	22
12	82	11	12	56	14
11	70	6	11	30	4
10	58	7	10	35	8
9	59	6	9	25	5
8	30	6	8	15	1
		132			168

SCORES VERSUS DIAGNOSES

The patients had previously been classified according to The Statistical Manual prepared by The National Committee for Mental Hygiene and it was possible to compare the ratings of the different diagnostic groups. As might be expected the feeble-minded made up the largest part of the inferior group, those with IQ's below 80; while the group designated "no psychiatric condition" made up the greater part of the superior

TABLE 2

Score versus mental ages

I.Q.'s above 80		I.Q.'s below 80
Mental age	Score	Score
17.0	96	
16.9	93	
16.6	92	
16.3	94	
16.0	93	
15.9	91	
15.6	85	
15.3	95	
15.0		
14.9	94	
14.6	96	
14.3	95	
14.0	91	
13.9	91	
13.6	92	
13.3	89	
13.0	88	
12.9	91	90
12.6	89	90
12.3	84	79
12.0	76	80
11.9	74	89
11.6	84	78
11.3	83	79
11.0	85	83
10.9	74	74
10.6	72	74
10.3	71	73
10.0	64	73

TABLE 2—*Continued*

I.Q.'s ABOVE 80		I.Q.'s BELOW 80
Mental age	Score	Score
9.9	65	60
9.6	62	63
9.3		62
9.0	60	58
8.9	48	75
8.6	58	57
8.3	44	55
8.0	46	62
7.9		53
7.6	28	40
7.3	48	30
7.0	26	36
6.9		22
6.6		24
6.3		22
6.0		

TABLE 3

Median scores by year groups

I.Q.'s ABOVE 80			I.Q.'s BELOW 80		
Number of cases	Mental age	Score	Number of cases	Mental age	Score
10	16	95	21	12	84
7	15	92	19	11	83
17	14	93	32	10	74
24	13	91	43	9	61
23	12	85	22	8	58
19	11	82	23	7	43
7	10	71	8	6	22
9	9	62	168		
12	8	50			
4	7	29			
132					

group, those with IQ above 80. With but two exceptions in years 12 and 13 the constitutional inferiors rated higher than the subnormals and the subnormals higher than the feebleminded. Likewise, with but one exception, the constitutional inferiors whose IQ's were above 80, scored higher than their corresponding group whose IQ's were below 80, although the diagnoses were the same. The psychoneurotics fell only within the superior group, and although they were numerically small, their scores were higher than those of any other diagnostic group.

TABLE 4

Boys' versus girls' scores

I.Q.'s ABOVE 80					I.Q.'s BELOW 80				
Age	Boys		Girls		Age	Boys		Girls	
	Score	Number	Score	Number		Score	Number	Score	Number
Above 16			91	7	Above 16	59	3	76	6
16	93	3	93	14	16	81	8	71	19
15	96	11	91	19	15	61	13	76	28
14	93	5	87	13	14	71	15	71	22
13	83	7	81	17	13	60	8	58	14
12	89	6	81	5	12	68	7	40	7
11	78	3	72	3	11	36	4		
10	73	4	62	3	10	40	5	33	3
9	67	5	63	1	9	25	5		
8	62	0			8	15	1		

The psychopaths, on the other hand, generally fell below the scores made by the no psychiatric condition group, although invariably higher than the constitutional inferiors. Our results, then, do not confirm the Ten Point Scale of Psychopathy, in that a high score does not indicate the psychopathic function.

SEX DIFFERENCES

Table 4 can lead to but one conclusion—that boys score higher than girls in a test of this kind; this is particularly manifest in the better group, IQ above 80. An analysis was not made of the nature of the questions failed by boys as against that of girls, but it may be presumed that boys, being less restricted in their freedom on city streets, acquire a more extensive knowledge of their immediate environment.

SCORES VERSUS SOCIAL GROUPS

In the estimation of social status, an arbitrary value was assigned by qualifying the total home influences as poor, fair, or good. A further check was obtained by designating the education of the parents on a Scale of 10 points, obtained as follows:

0—Illiteracy
1—Literate
2—Grade school
3—Grammar school
4—High School
5—College

The information covering educational background was not accurate enough for anything more than this general rating. Analysis showed a greater tendency for the scores to increase in proportion to the higher rating of the home and educational advantages of the parent, indicating that the child of inferior intelligence from a home possessing good features and of parents educated beyond mere literacy, is apt to be better oriented and better informed than his companion in a poorer environment. To some extent this is true of the child of the superior group, similarly situated, but the general indications are less marked that he will surpass his less fortunate brother in poorer surroundings.

The only two noteworthy features of the analysis of scores by school grades (table 5) are (1) that the progression of median scores is consistently gradual from the second to the eleventh grades, the chief break occurring after the fourth grade, and (2) that the score attained by Special Room pupils is practically equivalent to a fifth grade score. It must be recalled, however, that the Special Grade score represents older pupils who are retarded while the fifth grade score represents also a certain number at age for grade. Comparing this table with table 1 it will readily be seen that the scores for chronological ages are higher than the corresponding grade scores to be expected, the cause for which discrepancy is probably due to the fact that pedagogical retardation is as a rule to be found among these clinic cases.

TABLE 5

Score versus school grade

GRADE	MEDIAN SCORES	NUMBER OF CASES
Second	30	4
Third	51	32
Fourth	66	24
Fifth	77	32
Sixth	80	20
Seventh	83	36
Eighth	92	52
Ninth	96	44
Tenth	97	12
Eleventh	96	8
Special	75	28

LANGUAGE DIFFICULTY VERSUS SCORE

Language difficulty, among our cases, occurred only in Polish, Italian, and German speaking homes. The cases in which language difficulty was noted and recorded by the examiner are only 48 in number, which when tabulated by various years, nationalities, and degree of intelligence, do not present reliable statistical facts. However, it may be stated that in general the amount of deficiency on an Information Test does not seem proportional to the handicap which is encountered on the individual intelligence test. That is, a child more quickly acquires street jargon and information concerning his immediate environment than he does the language necessary for the more formal test material.

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TABLE 6

Tests failed by group whose IQ's are above 80

1. Assumption is made that what is failed by a 16 year old will, as a rule, be failed also by those younger.
2. By failure is meant that 75 per cent or more of group at a given age fail to pass test.
3. Items are given in order of difficulty.

Year XVI.	Name something made in Battle Creek. In Grand Rapids.
	Name 2 law courts in Detroit.
	Who is Frank Cody?
	Location of Post Office and County Building.
	Location of City Hall and Main Library.
Year XV.	What is meant by registering letters?
Year XIV.	Who is James Couzens?
	How can we get from here to town by streetcar?
Year XIII.	What is meant by jay walking?
	What does W. W. J. stand for?
	Who can be a citizen?
	What is meant by insuring a package?
	Give one safety first rule.
	What does D. S. R. stand for?
Year XII.	On what continent do you live?
	Who is Edgar Guest?
	What is the capital of Michigan?
	What is meant by sending a letter special delivery?
Year XI.	What was your mother's maiden name?
	Name a residence street in Detroit. A boulevard. A business street.
	Name the months of the year.
	What is the capital of the United States?
	What is a bootlegger?
Year X.	In what year were you born?
	In what county do you live?
Year IX.	In what country and state were you born?
	How tall are you?
	What would you do if you were lost?

TABLE 7

Tests passed by group whose IQ's are below 80

1. It is assumed that what is passed by an 8 or 9 year old is also passed by those older, therefore the additions to each year are cumulative.
2. By passing a test is meant that 75 per cent or more of the group at a given age succeeds with it.
3. Items are given for various years in order of ease of accomplishment.

Years VIII and IX.	Name. Age. Address. Name of city.
Year X.	Names of brothers and sisters. Are your parents living? Who brought you to this clinic?
Year XI.	Have you a bank account? Name 2 newspapers. What is your father's name? Name the days of the week.
Year XII.	All of the above items plus: How long have you lived in the U. S.? Name 2 things you must do in sending a letter. What does your mother do? Where can you buy gasoline and milk? What is a janitor? How much do you weigh? Name the months of the year.
Year XIII.	All of the above items plus: What does your father do? Who is Harold Lloyd? Names of 3 street car lines. What should you do if a fire breaks out in your home? Names of 2 hospitals. Name of one church. What does U. S. stand for?
Year XIV.	Where do you buy a hot water bottle and screw driver? Name something made in Detroit. When is your birthday? Where were you born?

TABLE 7—*Continued*

Year XV.	Name 5 street car lines in Detroit. Who is Henry Ford? Name a business street in Detroit. Name 3 boat trips you can take from Detroit. Name 2 moving picture houses.
Year XVI.	Why are you here? What is a conductor and janitor? Give one safety first rule. Where can a bolt of cheese cloth be bought? What would you do if you were lost? Names of 3 Detroit stores. Hour of day and date. Name of state. In what year were you born. Who is Andy Gump?

CRITIQUE OF THE TEST

An analysis of the difficulty and ease of accomplishment of individual items is presented in tables 6 and 7. As would be expected in a test applied to individuals ranging in chronological age from 8 years to adulthood, not all questions would have the same practical value. Nevertheless, there are two extremes wherein some of the tests have no value as differentiating instruments, these to be found in those tests passed by more than 75 per cent of the 8 and 9 year olds and those failed by 75 per cent or more of the 16 year olds. On the basis of these findings, the test is being modified and reorganized to eliminate valueless questions, and perhaps to reduce its length if compatible with a range of sufficient variation to allow for interpretations.

SUMMARY AND GENERAL CONCLUSIONS

1. There is a general tendency for the degree of orientation and amount of general information which a subject possesses to increase disproportionately as he becomes older; i.e., he acquires more than his intellectual status would predict.

2. Scores decrease as the mental age decreases for given age groups.

3. For diagnostic groups, the order of arrangement in respect to scores is arranged in descending rank; psychoneurotics, no psychiatric condition, psychopaths, constitutional inferiors, subnormals, feeble-minded. Our tests do not show that a high score indicates the psychopathic function.

4. Boys, particularly in the higher group of IQ's, rate consistently higher than girls.

5. Better home environment and superior educational advantages *act to give the child of inferior intelligence similar* advantages in orientation and information; the same is not true of the normal or superior child who seems to rate equally well regardless of environment.

6. Gain in score is consistent with progress in school.

7. Language difficulty is less operative on a general information test than upon more formal tests requiring linguistic facility.

WAYNE COUNTY PSYCHOPATHIC CLINIC

D. P. C. No..........Name..........Date..........Examiner........

General Information Test

1. (a) What is your name?
   (b) How old are you?
5) (c) When is your birthday?
   (d) In what year were you born?
   (e) Where were you born?

2. (a) What is your address?
   (b) In what city do you live?
   (c) In what county do you live?
8) (d) In what state do you live?
   (e) In what country do you live?
   (f) On what continent do you live?
   (g) What is the capital of Michigan?
   (h) What is the capital of the United States?

3. (a) How long have you lived in the United States?
   (b) How long have you lived in Michigan?
   (c) How long have you lived in Detroit?
   (d) What year is this?

9) (e) What month?
(f) What day of the month?
(g) What time is it?
*(h) What is meant by Standard time?
*(i) In what time belt is Detroit?

4. (a) What are the names of your brothers and sisters?
(b) What are the ages of your brothers and sisters?
(c) What was your mother's maiden name?
6) (d) What does your mother do?
(e) What is your father's name?
(f) What does your father do?

5. (a) Name five car lines in Detroit.
(b) How could you get from here to town by street car?
(c) Name three big Detroit stores.
13) (d) Where is the Main library?
(e) Where is the City hall?
(f) Where is the main Post Office?
(g) Where is the County building?

6. Who is each of the following?
Ty Cobb
Henry Ford
Edgar Guest
10) Andy Gump (Detroit Free Press comic)
Harold Lloyd
James Couzens (former Mayor, present Senator)
Frank Cody (Superintendent of Detroit Public Schools)
What is meant by
D. S. R. (Detroit Street Railway)
W. W. J. (Detroit News Radio Station)
*W. C. X. (Detroit Free Press Radio Station)
7. (a) Have you a bank account?
*(b) How would you start a bank account?
7) (c) What are the hours for banking?
*(d) Between what hours are stores generally open?
*(e) Name two things you could do at the Post Office.
*(f) Where could you go for help from the City?

8. (a) If you were lost what would you do?

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* This question has been dropped in the last modification because it did not meet the requirements of the test.

(b) What would you do if a fire broke out in your home?
(c) What is jay walking?
7) (d) Give one safety first rule.
(e) Name a business street, a boulevard and a residence street of Detroit.

9. (a) Where could you buy a hot water bottle; screw driver; bolt of cheese cloth; gasoline; milk?
(b) What is a janitor?
What is a conductor?
What is a bootlegger?
27) What is a carpenter?
What is a traffic officer?
(c) Name one thing made in
Grand Rapids
Battle Creek
Detroit
(d) Name two newspapers published in Detroit.
(e) Name two courts in Detroit.
(f) Name four hospitals.
(g) Name three boat trips you could take from Detroit.
(h) Name two moving picture houses.
(i) Name one church building in Detroit.

10. (a) How tall are you?
(b) How much do you weigh?
(c) Are you a citizen?
(d) Who can be a citizen?
8) (e) How can one become a citizen?
(f) Who am I?
(g) Who brought you to this clinic?
(h) Why are you here?

A STUDY OF SOME COMMONLY USED PERFORMANCE TESTS

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The following study is an analysis of eleven commonly used performance tests, to determine whether these tests contribute any additional information to the general intelligence rating measured by the Stanford-Binet scale, and to determine the best substitutes to be used when the Stanford-Binet or other intelligence test cannot be applied.

In the clinical examination of children, many types of supplementary tests are ordinarily given in addition to tests of general intelligence, such as vocational tests, educational tests, volitional and emotional tests, and a large number of performance tests, few of which have stated purposes. Many of these tests are used to verify the mental rating, particularly when there is language difficulty, deafness, or other defect which might invalidate the Stanford-Binet rating.

The common assumption that many of the various performance tests used furnish information additional to that given by the Stanford scale has not been verified. Necessarily, in any individual examination, only a limited number of all the known performance tests can be used and the question of selection is important. Thus far, many of the tests are commonly considered as attention tests, alertness tests, tests of social adaptability, etc.[1]

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[1] In an article by Garrett, H. E., and Lemmon, V. W.: An analysis of several well-known tests, Jour. Applied Psychol., 1924, viii, 424–439, the author presents the same need for analysis of tests that we do. The work was done with college students and the only one lapping of tests used is with the cancellation of A. He finds a correlation of 0.40 with intelligence.

The specific performance tests selected for study were the following: Healy Picture Completion's I and II, Healy Mare and Foal Picture Board, Healy Construction Puzzle A, Seguin Form Board, Knox Cube Test, Glueck-Knox Ship Test, Porteus Maze, Cancellation of A, Pintner Directions Test, and the Trabue Completion Test.

Healy (1) Picture Completion I was originally devised by Healy for "estimating the power to make connection between different portions of the mental content," (p. 189). Dr. Healy found that "at ten years the performance is as good as at thirteen years . . . . in fact, at nine years the results are not far behind" (p. 201). He states in conclusion, "We evidently have in our completion picture a test for ability primarily adapted to the child type of mind. . . . . We cannot expect a much better average performance with increasing years; indeed, good results may not be obtained from older cultivated individuals" (p. 203). Pintner and Anderson (2) standardized this test for mental ages five to sixteen inclusive, and their norms were used in this study.

Healy Picture Completion II (3) was devised by Healy as a test of apperception, considering apperception as essential to "any fair attempt to measure intelligence." This test was standardized by him for ages six to sixteen inclusive.

Healy Construction Puzzle A (4) was devised "to bring out the perception of relationships of form and also the individual's method of mental procedure for the given task, particularly for his ability to profit by the experience of repeated trials in contradistinction to the peculiar repetition of impossibilities characteristic of the subnormal and feeble-minded groups." He states that one should record the time and number of moves made, but gives no norms. This test was standardized by Pintner and Paterson (5) on 1005 school children, ages seven to sixteen, according to moves and time. Since both norms are considered as equally reliable for mental age level, norms for time only were used in this study, time score being more easily obtainable.

Healy Mare and Foal Picture Board was devised by Healy

(4) to test "perception of differences in form, powers of coördination,—the ability to learn by the experiences of trial and success." Pintner and Paterson (6) simplified this test by omitting the three geometrical figures, and standardized it for ages five to sixteen inclusive, according to speed of performance, on 667 school children.

In the use of the Seguin Form Board, a test for the perception of form relations, Sylvester's (7) standardization was adopted. Norms were available for ages five to fourteen inclusive, according to the shortest of three trials.

The Knox Cube test was originally used by Knox (8) in his scale for estimating the intelligence of non-English speaking adults, and is presumably a test of general intelligence. In this study, Pintner's modification of the test was used, norms being available for ages four to fifteen inclusive (9).

The Ship test was originally devised by Glueck as a test of general intelligence in non-English speaking adults, and was adopted by Knox (10) in his scale for mental defectives, using the test at age levels thirteen and above. The test was standardized by Pintner and Paterson (5) for ages five to twelve inclusive. The norms furnished by them were followed in this study.

Porteus (11) originally devised his Maze test as a test of social fitness, which he states, demands "ordinary prudence, foresight, and common sense methods," and the ability "to sustain attention and to succeed in a task." The test is standardized for ages three through fourteen.

The norms used for the Cancellation of A test (hplg form) were those given by Pyle (12). He states that the test measures "quickness of perception and discrimination and to some extent quickness of reaction" . . . . and adds, "as far as I have been able to determine, it has not very close relation to general intelligence."

The Pintner-Toops Revised Directions (13) test used is a modification of the Woodworth and Wells Easy and Hard Directions (14) test. These latter tests were devised by Woodworth and Wells to "attempt to test the ability to understand instructions—that is, to discover the subject's speed in apprehending them." It was assumed by Pintner and Toops that the test measures what the originators intended it to test, and they made no further analysis of it. They standardized it on 1756 cases, children and adults.

Scale A of the Trabue Completion test (15) was used in this study. Concerning this test the author says, "On the whole, however, it will be found that ability to complete these sentences *successfully is very closely related to what is usually* called 'language ability.' Ebbinghaus characterizes it as 'a real test of intelligence.' It has been variously classified by psychologists as a test of 'imagination,' as an 'association test,' as a 'test of memory,' and as a test of numerous other 'faculties'; as a matter of fact, the completion of incomplete sentences correlates remarkably well with almost any other measure of desirable qualities. It would perhaps have been just as descriptive to have used the classification 'general stand-out-ishness,' suggested by Professor Hollingworth." Trabue classifies it as "*for educational purposes as* 'language scales.'" Norms were available in this test for ages four to eighteen.

The performance tests described, together with the Stanford-Binet intelligence test, were given to 539 subjects. Because of time limitations, the entire series of performance tests were not given in each case. Since the purpose of this study is primarily the examination of individual tests, and not the individual performances, results are not affected by incompleteness in series. The subjects for this study were unselected cases examined at the Institute for Juvenile Research,[2] children referred for examination because of mental defect or behavior difficulties. The distribution thus covered a wide range of chronological and mental ages. This distribution is given in table 1.

The distribution curve made on the intelligence quotients ranged from below 0.50 to above 1.30. The curve was skewed on the lower ends, since approximately twenty-five per cent of the cases fell into each of the following groups: 89–109; 79–89; 69–79, i.e., the intelligence of this group falls just below a normal, unselected group.

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[2] The Institute for Juvenile Research, Dept. of Public Welfare, State of Ill., Chicago, Ill. Herman M. Adler, Director.

The method of study of individual tests used was to find the correlation of their mental ages with the Stanford-Binet mental age, assuming that the Stanford-Binet is a measure of general intelligence. All correlations were further checked by repeating the tests on approximately fifty new subjects. If a test proves to have a low correlation with the Stanford-Binet, it is evident that the test does not measure general intelligence; if the correlation is high, it may be concluded that the test measures at least some factors of general intelligence, and is, therefore, valuable as a substitute for the Stanford-Binet, where the latter cannot be given. Table 2 gives the correlations obtained on the first series of cases, as well as the correlations found by Johnson and Schriefer (16) on some of the same tests.

TABLE 1

MENTAL AGE	CHRONOLOGICAL AGE														
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
3	1		1	2		3	1		1						9
4			7	7	4	2		1	1	1					23
5			2	13	4	7	5	2	1		3	2	1	2	42
6			2	4	5	9	11	3	3	1	1	1		4	44
7			1		7	13	11	8	7	2	2	2		8	61
8					3	6	13	19	12	8	4	3	6	12	86
9						3	8	14	9	16	12	15	9	9	95
10					1	1	2	8	7	6	13	13	4	9	64
11									3	7	2	12	8	10	42
12									3	4	4	7	3	4	25
13									1	2	2	7	8	5	25
14								1		1		5	3	1	11
15									1		1		2	2	6
16								1				1		1	3
17														2	2
18														1	1
	1	0	13	26	24	44	51	57	49	48	44	68	44	70	539

The Johnson and Schriefer correlations were made between the chronological ages of the children and the mental ages on the performance tests.[3]

Since these correlations may have been affected by the fact that the unselected cases examined were really selected as far as intelligence was concerned, i.e., the majority of the cases had a mental age of thirteen years or below, a second series of fifty cases were tested.[4] The second correlations verified the findings of the first tests, i.e., although correlations were, on the whole, lower, due to the smaller number of cases, yet the respective places were the same and the type of distribution remains the same.

TABLE 2

TEST	NUMBER OF CASES	CORRELATION	P.E.	JOHNSON AND SCHRIEFER
1. Pintner-Toops Directions......	177	0.79	0.001	
2. Seguin Form Board............	346	0.76	0.022	0.65
3. Porteus Maze..................	118	0.75	0.03	
4. Trabue Completion............	123	0.73	0.029	
5. Healy Picture Completion I....	118	0.60	0.039	0.55
6. Healy Construction Puzzle A...	109	0.59	0.041	
7. (Healy Mare and Foal)........	124	0.55	0.043	0.55
8. Glueck Ship...................	119	0.46	0.048	0.53
9. Healy Picture Completion II...	143	0.41	0.047	
10. Cancellation of A..............	131	0.46	0.046	
11. Knox Cube Imitation..........	122	0.56	0.042	0.51

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[3] A study by F. Gaw: A study of Performance Tests, Brit. Jour. Psychol., April, 1925, presents results with fourteen tests. The work was done with English Elementary School and Canal Boat Children. One of the conclusions is that performance tests are less influenced by environment and lack of schooling than is the Binet.

[4] The following correlation on fifty cases were found: Pintner-Toops Directions, $r = 0.83 \pm 0.03$; Seguin Form Board, $r = 0.55 \pm 0.01$; Porteus Maze $r = 0.59 \pm 0.03$; Trabue Completion, $r = 0.87 \pm 0.02$; Healy Picture Completion I, $r = 0.57 \pm 0.06$; Healy Construction Puzzle A, $r = 0.42 \pm 0.07$; Mare and Foal, $r = 0.42 \pm 0.07$; Glueck Ship, $r = 0.49 \pm 0.07$; Healy Completion II, $r = 0.42 \pm 0.08$; Cancellation of A, $5 = 0.37 \pm 0.09$; Knox Cube Imitation, $r = 0.48 \pm 0.07$.

The first four tests in table 2 shows a "high" correlation with the Stanford scale. These are the tests which showed a regular distribution, with no disproportionate number of cases making unusually high scores on the test. These results indicate that these tests, therefore, may be used as tests for determining the mental age level, and are not tests which measure any special abilities, other than those included in general intelligence.

The Pintner-Directions test has been described as a test of the ability to understand instructions from the high correlation with Stanford, we may assume in this case also that the ability to understand instructions is a factor of general intelligence.

The high correlation of the Seguin Form Board with Stanford indicates that this test is a valuable one to use as a supplementary non-language performance test.

It has been said that the Porteus maze is a measure of social adaptability, considering this trait independently from intelligence, but the high correlation of 0.75 with Stanford indicates that if the test is really a measure of social adaptability, then this trait is a function of general intelligence.

The Trabue Completion scale is purely a language test, so that one would expect a fairly high correlation with Stanford. The correlation of 0.73 is sufficiently high to indicate that this test may safely be used to give a rough estimate of the intelligence level, when only a brief time interval is available, or when a large group is to be examined.

The fact that these four tests correlate highly with Stanford is not an indication that these tests alone are equivalent to the Stanford scale. In the first place, at best these tests give mental ages only within half year groups, and in the second place, they do not give the qualitative differences shown by means of the Stanford Examination.

The next four tests listed, with correlations of 0.60 or below, all showed irregularities of distribution, that is, many subjects from six to twelve years made scores as high as sixteen years on certain of the tests. An illustration is given in table 3, which shows the distribution table for the Healy Construction Puzzle

A. When the distribution is characteristic of that shown in table 3, it would indicate either that the test is poorly standardized or that it measures some special ability other than general intelligence. In the latter case it would seem that the test *should not be used to indicate general mental age level*, comparable to the Stanford, but should be used only for the purposes of qualitative analysis. This seems to be the case with the Healy Picture Completion I, Healy Construction Puzzle A, Healy Mare and Foal, and the Ship Test. Healy, when he devised his tests, evidently meant them to be used for purposes of qualitative analysis, and indicated that then Healy Picture Completion Test I should be solved by ten year old children, and that the Mare and Foal was usable for children under eight years of age. He also indicated that the Construction Puzzle A was useful for qualitative analysis of the methods of procedure in a task and the ability to profit by one's errors. The Ship Test, although used as a test for general intelligence, evidently does not adequately measure this as the correlation with Stanford is low and the distribution very irregular. It can be seen from table 4 that many cases as low as six years of age made the maximum score on the Ship Test, while those with

TABLE 3

HEALY A MENTAL AGE	MENTAL AGE, STANFORD-BINET													TOTAL
	4	5	6	7	8	9	10	11	12	13	14	15	16	
16		2			3	1	5	1	4	2	2	1	1	22
15			1		1	2	3	2	2	2	2			15
14						1	2	1						4
13					2		1							3
12			1		2		1							4
11			1	4	1	1	1							8
10	1	1		5	2	3	3	1						16
9		2	2	2	1		1	1						9
8				1	1	5								7
7	1	4	2	9	2	2		1						21
	2	9	7	21	15	15	17	7	6	4	4	1	1	109

mental ages of twelve or above made low scores on the test. In other words, the test is poorly standardized at the lower and upper ends.

The results on these five tests indicate that age levels by these tests are indicators not of general intelligence level, but of some functions which require further analysis. A recent study of Construction Puzzles A and B, carried on at the Judge Baker foundation verified our results. The experimenters concluded that "In opposition to some earlier investigators we are forced to conclude that neither Construction A nor Construction B, is an age level test" (17).

TABLE 4

Distribution on ship test

SHIP MENTAL AGE	STANFORD MENTAL AGE														TOTAL
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
12				3	2	3	1	6	2	6	2	1			26
11						1	1	3	1	1	1	1			9
10						1				1					2
9					2	1	7	4	1						15
8			1		3	1	2	3		1	2			1	14
7		1		3	2	2	1	1							10
6	1		2	2	9	4	1	1	1	1					22
5			2	5	4	2	6	1			1				21
	1	1	5	13	22	15	19	19	5	10	6	2	0	1	119

Healy Picture II has always been considered a test of special ability and we are inclined to agree with the belief. It shows a low correlation with Stanford and a fairly regular distribution. Healy indicated that this test was a test of apperception, considering apperception as essential to "any fair attempt to measure intelligence." Bronner, in further study of the test, characterized apperception as a special ability, but gave us no clear cut analysis of application of that ability.

Perry finds it to be a test of social adjustment. She found that many feeble-minded subjects who did well on this test were more able to succeed socially than those who failed on it (18). It is suggested that this type of investigation be carried on with a larger number of cases to give more positive results.

The remaining two tests of the series, namely, Cancellation of A and Knox Cube Imitation, although giving low correlations with Stanford-Binet, have regular distributions. These results indicate that these tests of a special ability which needs further study. The results of the Cancellation test confirm those of Pyle, who found that the test has no close relation to general intelligence. Whether it is a test of attention still remains to be shown.

In the case of Knox Cube test, our results show that this test should not be used for the purpose of measuring what we call general intelligence. It is probably a test of a specialized ability, of visual rote memory, somewhat like that specialized ability found in repeating digits forward. The measuring and application of this remains to be found.

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SUMMARY

1. Eleven commonly used performance tests were studied, namely, Pintner-Toops Directions, Seguin Form Board, Porteus Maze, Trabue ,Completion, Healy Picture Completion I, Healy Construction Puzzle A, Healy Mare and Foal, Glueck-Knox Ship, Healy Picture Completion II, Cancellation of A, Knox Cube Imitation.

2. The study was made by means of correlating the performance test mental ages with Stanford mental ages, and studying the distribution of mental ages.

3. The group studied was a selected group from the Institute for Juvenile Research, Chicago, Illinois, and had an intelligence level slightly below the normal group. Correlations were checked by repeated correlations on fifty new cases.

4. The correlations ranged from 0.41 ± 0.047 to 0.79 ± 0.001; see table 2 for complete list of correlations.

5. The Pintner-Toops Directions Test, the Seguin Form Board, the Porteus Maze, and the Trabue Completion Test gave high correlations with the Stanford-Binet and had normal distribution curves and, therefore, may be considered as partial substitutes for the Stanford-Binet mental age.

6. The Healy Picture Completion I, the Healy Construction Puzzle A, the Healy Mare and Foal, and the Glueck Ship correlated from 0.46 to 0.60 but showed such variations in distribution that they cannot, as standardized, be considered adequate mental age level tests.

7. The Healy Picture Completion II, the Cancellation of A, and the Knox Cube Imitation had correlations below 0.60 with regularity in the mental age distributions. We would suggest that these three are tests of special ability and are not mental age level tests comparable to the Stanford-Binet. Further analysis of these tests should be made to determine what abilities they do test and how they may be applied in clinical psychology.

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A GROUP POINT SCALE FOR THE MEASUREMENT OF INTELLIGENCE

A Further Study in Method[1]

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The present scale is an extension of the work reported in the JOURNAL OF APPLIED PSYCHOLOGY, June, 1919, by Arthur and Woodrow under the title, An Absolute Intelligence Scale: A Study in Method (1). The significant feature of this scale is that stressed in the earlier report, namely, the use of a formula for discriminative value. This formula reads

$$DV = \frac{Av_2 - Av_1}{\frac{\sigma_2 + \sigma_1}{2}}$$

In it, DV stands for discriminative value, Av_2, for the average of the higher age group under consideration, Av_1, for the average of the lower age group, and σ_2 and σ_1 represent the standard deviations of the distributions of the higher and lower groups respectively.

The use of this formula in the present scale is based upon two main assumptions, the first of which is that the value of any test consists in its ability to mark off any given group of a hierarchy from adjacent groups. In educational testing, the test in question must mark off a given grade from the grade above it and from the grade below it. In trade testing, the test must mark off the apprentice group from the novice on the one hand, and from the journeyman on the other, and so on. In intelligence testing, the discriminative value of any test consists in its capacity to mark off any given group from the group of less ability on the one hand, and from the group of more ability on the other.

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[1] The original thesis, of which the present report is an abbreviation, is on file in manuscript in the library of the University of Minnesota.

The determination of what shall be regarded as groups of less ability and groups of more ability involves the choice of a criterion of intelligence. This leads to the second assumption that the only objective criterion of intelligence available at the present time is the chronological age scale. Intelligence is here regarded as a function of a growth process, presumably that of the central nervous system. This growth process is, in turn, a function of chronological age. Increase in the ability to perform any task that involves the central nervous system is, then, regarded as being indirectly a function of chronological age, during the growth period.

The use of the discriminative value formula in the construction of the present scale, is therefore based upon the double assumption that any type of measurement of behavior involving the central nervous system, which serves to mark off one chronological age group from its adjacent age groups is a measurement of intelligence; and the more clear the demarcation, and the larger the number of age groups that are differentiated by it, the greater is its value as an intelligence test.

The first use to which the formula was put was to determine the discriminative values of the various tests used for all available age levels. The preliminary work furnished data for the calculation of these values. Table 1 is copied from the earlier report as it shows the difference in discriminative value between the opposites test and the cancellation test. Although the increase in crude score units from age to age is greater, for all but two age groups, for the cancellation test, its discriminative value is less than that of the opposites test at every age level. Because of its low discriminative value, the cancellation test was omitted from the revised scale. The digits test, although exhibiting slight increase in crude score from age to age, showed discriminative value at every age level considered, and on this basis was retained in the revised scale, although the plan had been to omit it.

TABLE 1

Comparison of point norms of easy opposites with three letter cancellation

AGE	EASY OPPOSITES				CANCELLATION			
	Original norms		Discriminative value	Point norms	Original norms		Discriminative value	Point norms
6.5	0	0	0.9	x	12.1	5.2	0.8	x
7.5	1.1	1.2	1.1	x + 0.9	16.0	4.7	0.3	x + 0.8
8.5	2.6	1.5	0.9	x + 2.0	17.2	3.9	0.8	x + 1.1
9.5	4.4	2.5	0.34	x + 2.9	20.6	5.0	0.0	x + 1.9
10.5	5.2	2.1	0.65	x + 3.2	20.6	4.0	0.5	x + 1.9
11.5	6.5	1.9	0.40	x + 3.9	23.0	5.1	0.1	x + 2.4
12.5	7.4	2.1	0.55	x + 4.3	23.7	5.7	0.3	x + 2.5
13.5	8.6	2.6		x + 4.0	25.6	5.6		x + 2.8

TABLE 2

Comparison of data from earlier and later studies for the Word Building Test

C.A.	EARLIER		LATER	
	Average	Points	Average	Points
6.5	0.4	x	0.4	x
7.5	2.3	1.1	1.6	0.84
8.5	4.3	1.9	3.2	1.7
9.5	6.3	2.5	4.2	2.1
10.5	7.4	2.8	6.3	2.8
11.5	9.8	3.5	7.3	3.2
12.5	10.3	3.6	8.7	3.5

It is interesting to note in table 2 that for populations of unequal ability, the discriminative values of a given test at a given level agree much more closely than do the crude score norms.

The second purpose which the discriminative value formula serves is the reduction of the crude score norms of the various tests to comparable units. The discriminative value of any test at any age level constitutes a point value expressed in terms of a unit of variability. These point values, expressed in the same kinds of units, standard deviation, for all the tests and for all available age levels, are combined by summation for the various age levels of the separate tests into separate scales, as shown in table 1 under "point norms." These point norms of the separate scales are in turn combined to form a single scale of all the tests used.

The third use to which the formula for discriminative value lends itself is to furnish a simple system of weighting that is independent of subjective evaluation of the tests to be weighted.

Referring again to table 1, we see that the discriminative values are larger for the opposites test than for the cancellation test at every age level. When these values are regarded as points, we see that a nine year score on the opposites test is credited with more points than a nine year score on the cancellation test. This means that if both tests had been included in the revised scale, success on the opposites test would have had a much greater part in determining the final rating of a subject than would success or failure on the cancellation test. This matter of weighting does not appear to affect average ratings in any great degree, but it does affect the validity of individual scores.

Results obtained with a scale constructed on the basis of the discriminative value formula are considered comparable with results obtained with the Binet scales, as the fundamental assumptions are the same for both types of scale: First, that the discriminative value of a test consists in its ability to mark off a given group from adjacent groups, and second, that the groups to be used for determining the discriminative value of an intelligence test are furnished by the chronological age scale. The present method measures the discriminative capacity of a test in units of standard deviation. It was explained at some length in the earlier article that this value could be arrived at equally well by counting the number of cases of a group that fall between the average of a given group and the average of the next higher, or lower, group. The number of cases is changed into percentage of total number of cases, and this percentage is translated, by table, into sigma units. In the Binet method of scale construction, this same value may be arrived at by calculating the increase in per cent passing a given standard of achievement, between one group and the next.

This can be illustrated from the data of Terman, Lyman and Ordahl (2). Comparison of weights is passed by 50 per cent of the four-year-old subjects, and by 70 per cent of the five-year-old subjects. That is, 20 per cent more of the five-year-olds than of the four-year-olds are able to pass it. This means that if the capacity tested by this test is normally distributed, 20 per cent of the five-year-old group will have more of this ability than the average four-year-old, but less of it than the average five-year-old. This percentage constitutes the discriminative capacity of the test for these two groups, measured from the standpoint of the five-year-old group. If it had been larger, the discriminative capacity of the test would have been greater; if it had been smaller, the discriminative capacity would have been less.

It was explained at some length in the earlier report that the same portion of the area of the distribution surface that is represented by this 20 per cent, i.e., the portion of the area of the distribution surface for the five-year-old group that is included between the averages (50 percentiles) of the two groups, can also be determined by dividing the difference between the averages of the two groups by the standard deviation of the higher group and translating the result, by table, into percentage.

In the test used here for purposes of comparison the discriminative value of 20 per cent would determine automatically, in the present scale, a weight of 0.53 points at this level. By the Binet method, this 20 per cent would be compared with the percentages obtained from other tests with the result that this test would either be discarded from the scale, i.e., given zero weight, or else retained and given equal weight with every other test at the same level. Where tests are of practically equal value the Binet method is satisfactory, but whenever it becomes necessary to use tests of very unequal value the present method would appear to be more sound in theory, more accurate mathematically and to lead to more satisfactory results in practice.

The chief differences between the present scale and the scales of the Binet type are that (*a*) the present scale is an amalgamation of separate test scales and not of tasks or portions of scales, (*b*) its results are expressed first in equal units, standard deviation, making possible a measurement of the increase of intelligence from age group to age group instead of being expressed in the variable units of mental age, (*c*) the discriminative capacity between two age groups of a test is affected by the standard deviation of both groups instead of by that of only the higher, and (*d*) the discriminative value of a test in the present scale is not only objectively determined, but objectively evaluated in its relation to the other tests of the scale. Of these differences, none are so fundamental as to interfere in any way with a similar use of results in determining intelligence quotients, or with a comparison of those quotients when obtained.

THE SCALE

The revised group point scale was constructed by applying the discriminative value formula to the crude score data obtained with the following tests:

Trabue Language Completion
Substitution
Comprehension
Opposites
Word Building
Digits

Each of these tests was given in two parallel forms. Scales B, C and L of the Trabue Language Completion tests were used; B, with Series I, and C and L with Series II. Two sets of the Woodworth and Wells Substitution blanks were ordered. Form I had the standard key at the top of the page. Form 2 had the digits of the key in reverse order. The symbols in the key of Form 2 were arranged in the following order: square, triangle, cross, star, circle.

TABLE 3

Opposite Test: Parallel lists of graded difficulty, based upon children's frequency tables

STIMULUS	PER CENT PASSING	POINT VALUE	STIMULUS	PER CENT PASSING	POINT VALUE
Yes	92.08	1.59	Rich	91.76	1.02
In	89.16	1.77	Young	88.75	1.70
New	85.16	1.96	East	85.50	1.94
North	81.83	2.09	Empty	81.00	2.12
Heavy	77.16	2.26	Dead	76.66	2.27
Sharp	72.00	2.42	Sour	71.08	2.44
Weak	66.00	2.59	Wild	65.91	2.59
Love	61.50	2.71	Less	61.16	2.72
Best	53.75	2.90	Buy	53.00	2.92
Over	48.16	3.04	Friend	45.75	3.10
Push	41.66	3.20	Broad	41.41	3.21
Much	35.00	3.38	Increase	34.75	3.38
Tender	29.33	3.54	Strength	27.25	3.60
False	23.33	3.72	Generous	22.75	3.74
Rude	19.25	3.86	Like	17.06	3.92
Stormy	14.08	4.07	Part	13.00	4.12
Bless	7.91	4.40	Silly	7.50	4.43
Frequently	4.58	4.07	Refined	4.10	4.71
Injurious	3.16	4.83	Permit	2.10	4.90
Strict	0.83	5.33	Simple	0.83	5.33

The comprehension test had been constructed from three tests of the Kuhlmann-Binet Scale: drawing lines on squares according to directions, drawing squares on circles, and drawing triangles on squares. This test had demonstrated its value in the preliminary work. Form 2 was constructed by sub-

TABLE 4

Values of original norms when transformed into σ units or points

Av. = crude score norms; points = value in σ units.

C.A.	TRABUE SCORE			SUBSTITUTION AVERAGE			COMPREHENSION			OPPOSITES			WORD BUILDING			DIGITS			COMBINED CURVE
	Av.	Points	Scale	Av.	Points	Scale	Av.	Points	Scale	Av.	Points	Scale	Av.	Points	Scale	Av.	Points	Scale	Total points
6-0 to 6-11+	0.15	0.17	x	5.98	1.11	x	1.14	0.83	x	0.05	0.14	x	0.40		x	2.27		x	x
7-0 to 7-11+	2.75	1.45	1.45	15.34	1.27	1.27	2.29	0.72	0.72	1.25	1.11	1.11	1.52	0.84	0.84	3.82	1.14	1.14	6.53
8-0 to 8-11+	5.91	1.13	2.59	26.16	1.11	2.38	4.28	0.74	1.45	3.25	0.93	2.04	3.18	0.86	1.69	4.76	0.77	1.92	12.07
9-0 to 9-11+	7.62	0.56	3.15	33.05	0.66	3.04	6.12	0.50	1.95	4.54	0.50	2.54	4.21	0.43	2.12	5.08	0.32	2.24	15.04
10-0 to 10-11+	10.11	0.73	3.88	39.83	0.61	3.64	8.49	0.59	2.54	6.28	0.66	3.20	6.29	0.71	2.83	5.42	0.37	2.61	18.71
11-0 to 11-11+	11.41	0.34	4.23	45.37	0.49	4.13	11.00	0.55	3.08	7.30	0.38	3.58	7.31	0.31	3.15	5.74	0.34	2.95	21.12
12-0 to 12-11+	13.13	0.42	4.65	50.89	0.51	4.65	12.72	0.35	3.43	8.63	0.47	4.05	8.66	0.38	3.52	5.90	0.18	3.13	23.43
13-0 to 13-11+	15.79	0.62	5.27	55.31	0.40	5.05	14.23	0.33	3.77	10.55	0.70	4.75	11.24	0.64	4.17	6.18	0.32	3.44	26.45
14-0 to 14-11+	16.49	0.18	5.45	59.11	0.34	5.38	14.50	0.06	3.83	11.16	0.21	4.96	12.27	0.24	4.41	6.39	0.22	3.66	27.69
15-0 to 15-11+	17.92	0.32	5.77	62.63	0.31	5.69	15.51	0.24	4.06	12.20	0.34	5.30	13.98	0.39	4.80	6.48	0.09	3.75	29.37
16-0 to 16-11+	19.66	0.39	6.16	64.52	0.15	5.85	16.64	0.29	4.36	13.45	0.44	5.74	15.64	0.38	5.18	6.54	0.06	3.81	31.10
17-0 to 17-11+	20.19	0.11	6.27	67.07	0.20	6.04	17.20	0.16	4.52	14.00	0.22	5.96	16.80	0.25	5.43	6.58	0.04	3.85	32.07
18-0 to 18-11+	22.98	0.60	6.88	72.83	0.53	6.57	19.27	0.80	5.32	15.62	0.78	6.74	18.20	0.33	5.76	6.87	0.33	4.18	35.56

stituting "up" for "down," and "right" for "left," and vice versa, in the directions of Form 1.

Work with the opposites tests of the earlier scale had shown the need of standardization for children of the separate words of the lists used. Responses were obtained from 600 school children of grades II to VIII, inclusive, for 96 stimulus words. Two graded lists of approximately equal difficulty were prepared on the basis of these results and were incorporated in the revised scale. These lists are presented in table 3 with the per cent of successful response to each stimulus word, and the point value of each in units of standard deviation (3).

The two forms of the word building test, a, e, o, b, m, t and e, a, i, r, l, p were given and scored according to the directions given by Whipple. This test and the digits test were the only two tests of the preliminary series to be used without change in the revised scale.

Forms 1 and 2 of these six tests were assembled into Series I and II. The parallel forms were used, not for the purpose of supplying alternative tests, as might be supposed, but to increase the reliability of individual scores. The two series were presented approximately one month apart. Results from the two forms were averaged for each test.

Crude scores were obtained with these tests for 2517 pupils of grades I to XII inclusive. The discriminative value of each test at each age level was calculated. These values were combined by summation for each test, as shown in table 4. The cumulative value constituted the point norm corresponding to the crude score norm for each test at each age level. Between the year norms point values were calculated for all possible scores falling between the crude score norms. It was assumed that the standard deviation of the 18.5-year group would remain constant for all higher age groups, and point values were calculated upon this basis for scores falling above the 18.5-year norm. It was also assumed that the standard deviation of the 6.5-year age group would remain constant for all lower age groups, and upon this basis point values were calculated for all scores falling below the 6.5-year norm. There is, of course, an element of error in both these assumptions, but it is, presumably, not serious inasmuch as the scale was given to children of 6.5 to 18.5 years, inclusive, and only a scattering handful of cases fell outside these limits. By means of the separate scales so constructed, individual crude scores for the separate tests were converted into point scores for those tests.

A combined scale was constructed by adding the point norms for the separate tests at each age level. Values were interpolated between the year norms of the combined point scale to correspond with months of mental age.

The procedure, then, in finding the rating of a given subject was (*a*) to find the crude score on each form of each separate test, (*b*) to average the scores of the two forms of each test, (*c*) to translate the average crude score into point score for each test, (*d*) to add the point scores of the separate tests, (*e*) to translate point scores, by table, into years and months of mental age, and hence to IQ.

Data obtained from foreign pupils with less than one year of experience in an English speaking school were disregarded. The pupils whose scores were considered valid constitute a group that is not unselected in one sense, as a very large percentage of them were of foreign birth or parentage. But they were as nearly unselected a group as one could reasonably hope to obtain for the ages 6 to 15 inclusive, in the sense that all the individuals of these ages in the given school district at the time the tests were administered were present and were represented by test scores. The only cases of school age not represented by test scores would be those under detention in state institutions and those under quarantine for some infectious disease. Of the former, there were three cases in the state school for the feebleminded, and one in the state school for the deaf; and of the latter, there were several families under quarantine for scarlet fever.

These children were not "test wise." For most of them, the intelligence test situation was wholly new.

RESULTS

In the preliminary study were published intelligence quotients for 51 cases tested individually by the Kuhlmann 1917 Revision of the Binet-Simon scale. The uncorrected coefficient of correlation between the two sets of quotients was found to be 0.78 (Bravais-Pearson). This we considered surprisingly high at the time, in view of the greater accuracy of individual tests as compared with group tests, and considering the fact that some tests which were included in the group scale at that time had been shown to possess very low discriminative value. To quote directly from the earlier report: "We incline to attribute a considerable portion of the apparent success of the present tests to the method we have used, and to believe that inadequacy of the tests and norms is compensated by the advantage inherent in the methodological principles we have followed."

In the present study 275 cases were available for a similar comparison. Among these were the pupils of the five Grade II classes of a large grade school, besides cases referred for testing prior to grade placement, and "problem" cases. In figure 1 is given the scatter-graph showing the correlation between these 275 individual intelligence quotients obtained by the Kuhlmann-Binet Scale (1922) and the group intelligence quotients of the present group scale for the same subjects. For these, the uncorrected coefficient of correlation is 0.917 (Bravais-Pearson), or, discarding third place decimals, 0.92 ± 0.006. The correlation ratio also was determined. This, too, was found to be 0.92. The regression, therefore, is linear, according to Blakeman's criterion (4).

As the two sets of quotients appeared to run so closely parallel to each other, it seemed worth while to calculate their probable error, also. For this the Nygaard formula was used (5). This formula is based upon the average difference between the two sets of values. It yields a value that is independent of the form of the distribution curve, and that is not affected by the range of cases. The probable error was found to be 2.60. This means that intelligence quotients obtained by this scale at a given date agree more closely with Kuhlmann-Binet intelligence quotients obtained over a period of three years, than those for the Stanford-Binet agree with re-tests made with that same scale. Quoting directly from Terman: "Retests have been given to 315 children in the vicinity of Stanford University. To 46 of these children three or more tests have been given. In case of a child tested several times, each test has been compared with each of the others. . . . . This gives in all 435 comparisons . . . . The probable error of a prediction based on a first test is 4.5 points in terms of IQ." (6). Terman does not state what formula was used in calculating this value.

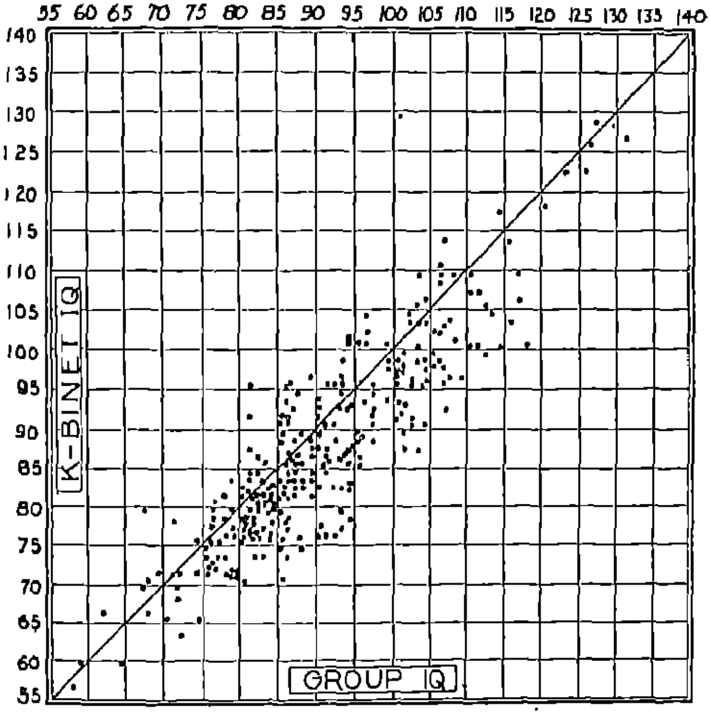

FIG. 1. SCATTERGRAPH SHOWING CORRELATION BETWEEN KUHLMAN-BINET IQ'S AND GROUP POINT SCALE IQ'S

TABLE 5

Showing distribution by mental age of each chronological age group

C.A.	6-0	6-0 TO 6-11+	7-0 TO 7-11+	8-0 TO 8-11+	9-0 TO 9-11+	10-0 TO 10-11+	11-0 TO 11-11+	12-0 TO 12-11+	13-0 TO 13-11+	14-0 TO 14-11+	15-0 TO 15-11+	16-0 TO 16-11+	17-0 TO 17-11+	18-0 TO 18-11+	18-0	TOTAL CASES
22-0 to 22-11+															1	1
21-0 to 21-11+											1		2			3
20-0 to 20-11+												1			2	3
19-0 to 19-11+									1		1		2	2	7	13
18-0 to 18-11+											3	1	6	4	14	28
17-0 to 17-11+								5	5	2	2	8	9	7	20	58
16-0 to 16-11+							4	6	6	7	8	5	17	6	17	76
15-0 to 15-11+						4	9	15	10	11	20	16	19	12	15	131
14-0 to 14-11+					4	9	11	34	26	22	16	7	22	9	13	173
13-0 to 12-11+			1	4	5	16	13	47	21	31	29	12	14	6	3	202
12-0 to 12-11+				4	16	36	33	51	41	20	13	6	1	4		225
11-0 to 11-11+		1	2	7	49	56	52	54	29	7	7	2				266
10-0 to 10-11+			5	32	53	58	51	36	10	4						249
9-0 to 9-11+	2	2	37	69	82	57	20	11	2							282
8-0 to 8-11+	6	12	64	96	55	18	8									259
7-0 to 7-11+	43	57	103	66	16	1										286
6-0 to 6-11+	149	85	18	2												254
5-0 to 5-11+	5	3														8
Cases...........	205	160	230	280	280	255	201	259	151	104	100	58	92	50	92	2,517

Dr. Kuhlmann insists that the comparison of the probable error of measurement between the present scale and the Kuhlmann-Binet with that of the Stanford-Binet is unfair unless the fact is stressed that the present group scale consists of two parallel series of tests.

In the preliminary study, mental ages were recalculated from the group scale data for the 52 subjects for whom Kuhlmann-Binet scores had been obtained, using the year method. IQ's were calculated and compared with those obtained by the point method. The difference between the two series of IQ's ranged from 0 to 9, with an average difference of 3.4 points. Upon the basis of the average amount of error, the extra labor involved in the use of the point scale is evidently not worth while. From the standpoint of individual diagnosis, however, nine points of IQ constitute a significant error, and one to be avoided if possible. Point scale IQ's tended to run higher than those obtained by the year method, and to agree more closely with the results of the Kuhlmann-Binet scale.

In table 5 is given the distribution of cases of each chronological age group by mental age. It is largely self-explanatory. The bunching of cases at the levels <6.5 and >18.5 is of course due to the lack of differentiation in terms of mental age of cases falling within those groups. The cases of >18.5 are differentiated in terms of points, but a large percentage of those in the <6.5 group are not.

It will be noted that below the twelve year level there is a definite downward skew to the distribution. This is due to a tendency, inherent in a system of weighting based upon successive averages and standard deviations, for the subjects in the lower age groups to be penalized for falling below their appropriate age norms in some tests to a greater degree than they are rewarded for surpassing those norms in other tests. This can be illustrated by the hypothetical case of a 10.5-year-old boy whose scores range from the 6.5-year norm in Digits, to the 12.5-year norm in Opposites. If his Substitution score falls at the 9.5-year norm, his Comprehension and Word Building scores fall at the 10.5-year norms for those tests, and his

Language Completion score falls at the eleven-year norm, we find that he has been penalized 0.69 point for falling below the 10.5-year norm in Digits, and 0.60 point for falling below in Substitution, while he is rewarded 0.35 for exceeding the 10.5-year norm in Language Completion and 0.85 for exceeding it by two years in Opposites. Comparing total rewards with total penalties, we find that he has been penalized 0.09 point more than he has been rewarded, and that in consequence his total point score falls 0.09 point short of the 10.5-point norm, giving him a mental age of one month less, or ten years and five months. As stated above, this is the inevitable result of the tendency toward decrease in the difference between the successive averages as we ascend the chronological age scale, and of the tendency toward increase in the successive standard deviations. Both of these tendencies operate to decrease the size of the quotient yielded by the formula for discriminative value, at successive age levels, and consequently to decrease the added increment of points at those levels. This results in a definite, though slight, downward skew in the distributions of all age groups unless offset by counter-tendencies resulting from the selection of groups above the age of compulsory school attendance.

This slight downward skew was detected also in the distributions of the preliminary study. It is what should be expected when we use units of equal significance in measuring the ability of groups in which intelligence, in terms of years of mental age, is distributed according to the normal probability curve. For if the distribution of intelligence is normal when measured by the unequal units of the mental age scale, it must, of necessity, be skewed when measured by the equal units of the present point scale.

At the higher end of the scale there is an upward skew due, probably, to the selection operating above the age of compulsory school attendance. This selection results in a tendency for the differences between successive averages to increase, and for the successive standard deviations to decrease, with a consequent increase in the size of the quotient yielded by the formula for discriminative value. Success at the higher levels, therefore, tends to be over-rewarded and failure tends to be under-penalized.

The downward skew of the lower age groups, and the upward skew of these higher groups can be corrected by the use of average point scores as norms. This method yields a slightly more accurate rating. The scale as used in the present study is more flexible than a scale constructed of average point scores however, in that tests can be added or omitted at will without re-standardizing the scale as a whole.

SUMMARY

The significant feature of the present scale is the use of a formula for discriminative value. This formula reads

$$\mathrm{DV} = \frac{\mathrm{Av}_2 - \mathrm{Av}_1}{\frac{\sigma_2 + \sigma_1}{2}}$$

In it, DV stands for discriminative value, Av_2, for the average of the higher age group under consideration, Av_1, for the average of the lower age group, and σ_2 and σ_1 represent the standard deviations of the distributions of the higher and lower groups respectively.

The first use of the formula was to determine the discriminative values of the various tests used, for all available age levels.

The second purpose which the formula serves is the reduction of the crude score norms of the various tests to comparable units.

The third use of the discriminative value formula is to furnish a simple system of weighting that is independent of subjective evaluation of the tests to be weighted.

Results obtained with a scale constructed on the basis of this formula are considered comparable with results obtained by the use of the Binet scales, as the fundamental assumptions are the same for both types of scales: first, that the discriminative value of a test consists in its ability to mark off a given group from adjacent groups, and second, that the groups to be used for determining the discriminative value of an intelligence test is furnished by the chronological age scale.

The revised group point scale was constructed by applying the discriminative value formula to the crude score data obtained with the following tests: Trabue Language Completion, Substitution, Comprehension, Opposites, Word Building and Digits. Each of these tests was given in two parallel forms. Crude scores were obtained with these tests for 2517 pupils of grades I to XII, inclusive. These were translated by table into point scores, and thence into mental age and IQ

Of these pupils, 275 had been tested individually on the Kuhlmann-Binet scale. Comparison of the group IQ with the individual IQ yields an uncorrected coefficient of correlation of 0.92, ±0.006 (Bravais-Pearson). The correlation ratio also was calculated, and the regression was found to be linear, according to Blakeman's criterion. The probable error of measurement for the two sets of quotients, according to Nygaard's formula, was found to be 2.60.

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SLANG AS AN INDICATION OF CHARACTER

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The research here reported is an exploratory attempt in the field of character detection and measurement. The aim was to find an instrument which would differentiate delinquent children from non-delinquents. Other factors of age, mental age and intelligence quotient, of social and economic status, and even to some degree of nationality and race were to be kept constant. It was planned to construct tests along a new and original line and to apply these to two opposed groups of children, groups which, at least in so far as the experimenter could determine, differed only in the matter of moral character. A comparative study of the results was to be made in which the separate elements would be examined for whatever significance each might reveal. All such elements which survived the application of Yule's formula for determining the significance of differences were to be retained and thrown together into a new composite which it was hoped would bear up under later verification processes.

If a test could be evolved which would objectively pick out delinquents from non-delinquents, which would aid in the detection of potential delinquents, which would indicate to the examiner in some quantitative way the degree of delinquency of the examinee, the attempt would be more than justified. The main previous effort in this direction has come from Whittier, California. The Whittier scale, doubtless familiar to all interested workers, has been derived from careful scientific analyses of records of crime at the Whittier State Home for Boys. It consists of a series of offences listed on a chart, horizontally, according to the character or nature of the misdeed, from the least serious type to the most serious, from such light offences as truancy to such grave crimes as assault and battery and murder. Vertically, each kind of offence is graded for degree of participation, for example, from the first offence to an habitual one, or from the theft of some article of but little value to one of great worth.

A child's record is examined and his misdemeanors plotted on this charted list. His demerits are then totaled and he is given a score. The scheme works adequately when an intimate history of the case over a wide period of time is available. But often a child may be brought to court about whom relatively little is known except for the offence which precipitated him there. He may be a comparatively "good" boy, who having fallen but once from grace, fell hard. If his offence, and it may have been his first, is for some serious charge such as grand larceny, his score will be high. Rated side by side with some youngster who was constantly in trouble for petty thieving, truancy, and the like, the newcomer, by virtue of his Whittier index stands a chance of being characterized as the more delinquent. The scale aims, but often fails, to give an inclusive quantitative picture.

One of the problems of state institutions is how and when to determine parole. Many entrants are more or less parolable from the very beginning. Commitment within the walls of the institution is salutary lesson enough; continued residence is not necessary and for various reasons undesirable both for the boy and for the State. A test, therefore, which would sound the boy's behavior level, which would tap his conduct tendencies, both past and prospective, would assist materially in determining the moral status of the boy.

Prognosis might advisedly date even further back. If potential delinquents could be selected, possibly segregated, certainly supervised, before being given time to launch on their career of crime, many of the hardships of conduct maladjustment might be avoided. Preventive, therapeutic and educational forces could be brought to play on an incipient case with much greater effect than on the hardened reprobate of several months or years standing.

The only defence offered for the character and type of test material here chosen was an effort on the part of the author of the tests to tackle the problem from what might be the delinquent's end of the game. Ordinary tests usually contain words, ideas, and situations which may well be supposed to be within the reach and ken of every normal boy. If, in the devising of new tests, something could be assembled which might tap the experience of the delinquent rather more than the conformist greater possibilities of differentiating results might be hoped for.

The question of knowledge of crime and of life behind the scenes of conventional standards, and conduct in accordance with or against those standards, need not be discussed here. Suffice it to say that the tests evolved represent an effort to reach not only the boy's knowledge of what is socially undesirable but also his tendency to put the same into practice.

True situations calling for moral reactions, or their opposite, to be effective, would have to be concrete. No doubt many tasks could be devised where the purpose of the test situation is cleverly hidden from the subject, where he would be compelled to make a choice of reaction and be rated accordingly, but due to the pressure of time and circumstance, general administrative difficulties involved in giving and scoring individual tests, the scope of possibilities was here confined to pencil and paper and to group work. If the sum total of man's reactions can be catalogued into the threefold, thinking, feeling and doing, and if, as has already been hinted, what one thinks and feels is not necessarily consistent with what one actually does, the experimenter is compelled to confine his attention to the last named type of behavior. If our overt reaction were to be subdivided we might make the line fall between what one does and what one says. We tend to associate bad language with delinquent behavior, but is one an index of the other? How bad, or rather how good, can language be before its use becomes significant of the conduct of its spokesman? In other words, does the language used by the delinquent differ materially from that used by the so-called good boy? Does the delinquent have a wider knowledge of certain colloquial, slang and vulgar phrases? Does he evince greater familiarity with the terminology of the street or of the professional "dip?"

No effort was made to test for actual swearing, nor for practical reasons, was the full gamut of youth's misconduct sounded, but a great collection of slang phrases and street language was gathered and presented to the subjects in four different groupings: (1) definitions of single words, (2) definitions of phrases, (3) Same-Opposites, (4) classification of slang knowledge. For the first two groups the multiple choice method of response was offered, the selection of answer to be made from one of four alternatives: (*a*) a true meaning of the word or phrase expressed in good English, (*b*) a meaning not true, but plausible, in good English, (*c*) a slang meaning, but true, (*d*) a slang meaning but false. Interspersed with the slang words were some good literary English words, some of which were a little unusual, chosen from collections like the Thorndike Word Knowledge Tests. Interspersed with the slang phrases were some good English phrases or proverbs chosen from collections like those in Kohs' list. In the Same-Opposites test, slang words were paired sometimes with good English words, sometimes with slang words. Checks of paired literary words were scattered throughout. In group 4, the candidate was required to identify his word with the activity or type of delinquency with which it was ordinarily associated. The words were all indicative of the activities of the lower tenth of the social order, and were mostly slang, street language and in some cases professional "crook" terms.

Attention is called to the fact that scattered throughout the four groups, provision was made for a fairly liberal supply of ordinary English words which could be used not only as a rough estimate of the subject's general word knowledge, but also as a check against a possible tendency to react, or to fail to react to the test elements because of strangeness or distaste.[1]

With the coöperation of Mr. G. M. Willson, Assistant Psychologist at the New Jersey State Home for Boys in Jamesburg, to whom grateful acknowledgement is here made, it was arranged to give the tests to the boys in that institution. A previous preliminary try-out had revealed the undesirability *of attempting to test boys under ten years mentally*, whether delinquent or normal in social behavior. At Jamesburg, the files were carefully combed and only those boys were selected who were bright enough to understand and follow directions on a group test. In June a visit was made to the institution and test results of fifteen boys were analyzed and compared with the results of fifteen control boys from a small town in New Jersey. These results were significant enough to justify the further pursuit for data. In August the number was completed to one hundred cases, ranging in chronological age from ten to eighteen years with a median of 14.8. In mental age the range was from nine to eighteen, the median falling at 12.78. Intelligence quotients spread from 67 to 144, with a median of 88.25. This group was later closely matched for distribution of C.A.'s and M.A.'s, and for social and economic status from four public schools of a town in New Jersey.

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[1] A copy of the tests may be found at the end of this article.

Parental nationalities represented in each group were American, Italian, Colored, Hungarian, Irish, German, French. Some Russians and Poles were included only in the delinquent group, and some English, Danish and Swedish were in the control but not in the delinquent group. Catholics, Protestants and Jews were proportioned rather evenly in both groups. Sample occupations to be found in each group include those of laborer, carpenter, machinist, painter, factory-hand, truck driver, fire department and police service, stableman, printer, tailor, chauffeur, contractor, gardener and the like.

A side study of various methods of scoring the tests was made with the hope that by penalizing here or there a wider differentiation might be obtained. But this was not realized. It makes little or no difference whether a point is given for using the slang rather than the literary word in the multiple choice responses, although analysis of the results showed a slightly greater tendency on the part of the delinquents to express themselves in slang than for the controls. No material difference was apparent when penalties were assigned for giving the wrong answer, except that in the lower cases it became a question of handling minus scores. For this reason it was decided to keep to the simple scoring technique of assigning a point to each correct response whether or not that response was a literary or a slang word.

The results of the tests, when scored and tabulated for averages and dispersions show a fair and consistent differentiating power. Taken separately, these tests, with the exception of the fourth, under the caption of "Classifications" do not show very large P.E. differences, but because this difference is always on the one side, the four combined produced differential results which were acceptably significant, yielding a total difference of 7.1 P.E., 7.6 P.E., or 6.1 P.E., depending on the way the responses were scored.

Reference has already been made to the non-slang check words and phrases which were scattered throughout the four pages of test material. These were scored separately and the results are nothing short of astonishing in that the averages and distributions are almost identical for the two groups. On the slang material, 76 per cent of the delinquents reached or exceeded the median of the unselected children. On the literary words, exactly 50 per cent of the delinquents reached or exceeded the median score of the control group.

Considering that the slang battery revealed a substantial differentiating power and that the vocabulary of non-slang words failed to show such results, it was felt that here might be something of value which was worthy of further research. Consequently the writer undertook a careful and exhaustive analysis of all the material gathered. Every word and phrase in the slang battery was tabulated and recorded for its frequency of response. They by applying the formula advocated by Yule[2] the significance of each difference was determined. Where a sigma value of 2.5 and in some cases 2 was revealed that element was retained. The rest were thrown out.

Those elements which were found to have differentiating power were reassembled into a new composite together with many interspersed neutral elements which were to be disregarded in the scoring, the object of their inclusion being to keep some of the easier and more familiar words and phrases on the page and thus produce a more normal emotional reaction from the subject than would be experienced were he to be confronted suddenly with only the extreme elements. The words retained represented in every case a greater degree of response from the delinquent than from the non-delinquent group, many of these being crime words, or at least words representing an acquaintance with various forms of social misconduct.

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[2] "Introduction to the Theory of Statistics," p. 209, G. Udney Yule.

A probation school in Brooklyn was enlisted in which to try out the revision. Four classes of boys were tested by the National Intelligence Test and all falling below a mental age of ten years were discarded. The fifty cases remaining were matched from a public school, also in Brooklyn, the boys being of the same social level and in the corresponding school grades. The groups were equated for averages and variabilities of mental age and intelligence quotient.

The results of this testing were disappointing. No appreciable difference was found between the responses of the two sets of boys. The averages and dispersions of the two groups were about even.

Possible explanations are always in order. Since the problem of establishing a criterion and validating character tests has been at all times a great one, and since the writer failed finally to get differentiation by the method of comparing averages of two supposedly distinct groups, the question arises whether or not this failure is due to the fact that there may be no real psychological difference between the two groups, or that there may be a weakness in the method of arriving at conclusions.

The children in the probation school may or may not have been afflicted with the same sort of conduct disturbance which caused the Jamesburg boys to be committed. If there is any character weakness common to both we may feel reasonably safe in saying that the State Institution residents have it in greater degree, since they could no longer be retained in an ordinary social environment. The records at Jamesburg read some thing like this: breaking, entering and larceny, vagrancy, incorrigibility, malicious mischief, persistent truancy, grand larceny, shooting teacher, assault, and the like. Many cases offer combinations of several of these and other offences. The Brooklyn Probation School records offences of: school incorrigibility, disobedience, truancy, smoking, obscene language, laziness, stealing, pugnacity, sullenness, and the like.

Whether or not these two groups of boys represent steps on a scale of misconduct, the fact remains that the tests did not pick out the school incorrigibles from the school boys who were not rated as incorrigible. Part of the value of the tests, it was hoped, would lie in their prognosis of potential delinquents and in this apparently they fall short.

Of course, it may be that the probation group does not cover the delinquents of the future. Certainly the boys cooperated well and obediently in taking the tests. Discipline within the school room was rigid and exacting. Four teachers were present and there was no sign whatever of insubordination on the part of any pupil. Perhaps the reformative influence had already set in!

Again, it may be possible that the control group contained as many "bad" boys as were to be found in the delinquent group, but that because of a certain cunning or shrewdness, they had failed to be apprehended, or in other words, that the delinquents were not really selected and the controls unselected; that the two groups were comparable in every way, including the trait which the experimenter was trying to measure, and hence rendering differentiating results impossible.

The question of method of arriving at conclusions becomes a vital issue. The method of comparing contrasted groups presupposes a knowledge of the character of the groups studied. The fallacy may lie here. It might be better in future to confine attention to those children about whom definite and detailed and complete historical information is available, to correlate test scores with the evidence at hand, whether that be objective or subjective. In the case of established and recorded delinquents, a Delinquency Rating could be worked out consistent with the historical record. Where official papers are not available, the evidence could be some approved tangible, concrete and factual rating scheme, rated by people who are in a position to make judgments. Cady has shown the importance of close acquaintance and confidence on the part of the judge.

It might be advisable to study the relationship of judgments of this latter type with ratings on the former scheme, judges to be ignorant of the facts set down in official records. It might cast some light on whether or not school incorrigibility, which is probably the basis for a teacher's judgment is a different thing from the child's anti-social behavior which brings him up for commitment through the courts. Enlightenment here might cast some light on why different results were obtained in a State Institution group from those obtained in a public school probation group.

For whatever they may be worth to others the slang tests of the first survey are appended. While by no means exhaustive of slang in current usage, they represent an effort to cover those words and phrases which might fall within the experience of an ordinary boy or girl who has been exposed to an environment which makes use of slang as an avenue of expression. If some future investigator is interested in the question of verbal tests as a measure of intelligence, involving the issue of unfair advantage which they give to the child of superior environment, he might do well to take these "language" tests which represent a lower social order and make a comparative study of different social levels, casting aside the factor of conduct and confining his attention solely to the question of knowledge.

APPENDIX

DEFINITIONS

Look at this sample:

1. SNITCHING means . . . . sewing, squeeling, stealing, telling

SNITCHING means "squeeling," so a line is drawn under "squeeling."

Now look at sample 2:

2. CRACKED means . . . . broken, looney, cranky, crooked

Which of the last four words best explains the meaning of CRACKED? Either "broken" or "looney" will do, so draw a line under either one, but only under one.

Now on the rest of the page are a great number of exercises. Remember, underline only *one word* on each line, that word which will give the best meaning. Begin at the top and work all the way down the list until the time is called.

SIMP	means dumbell, simpleton, sink, scab
IVORY DOME	means cupola, bonehead, elephant's tusk, foolish
IRON MEN	means Crusaders, dollars, bones, rubes
SHEENEY	means Silky, Kike, Jips, Jew
TO BE STEWED	means drunk, cooked, tanked, batty
COTTON	means cloth, hut, flour, herd
THIS JOINT	means this house, knee, plunk, den
SQUEELING	means telling, yelling, whooping, tattling
VAMOSE	means beat it, car, go away, skidaddle
HOOTCH	means booze, beer, hatch, hoodlum
DASH	means rush, smear, lack, fasten
DEVOUT	means lawless, pious, devotion, formal
DIP	means cannon, vag, dive, thief
ELBOW	means collar, detective, cinch, bone
TIGHT-WAD	means booze-artist, narrow, stingy, close-fisted
FOBBER	means fob-worker, pick-pocket, watch-fob, mik
NUTS	means foolish, dippy, fruit, mut
ABILITY	means diligence, speed, power, dignity
LIGHT-FINGERED	means fairy-like, thievish, three-fingered, pussyfooted
CARGO	means load, hem, draught, vehicle
DUCK	means fowl, hide, beat it, pippin
WARM BABY	affectionate, woollen clothes, Hot Tamales, boob
DUKES	means hands, mits, aristocrats, bucks

Shyster means bum mouthpiece, crook, bad lawyer, shy
Clergyman means grandsire, employee, beadle, minister

PHRASES

Below are a great many expressions. Four answers are given after each expression. You are to look at the answers carefully; then make a cross in the space before the best answer to each expression, the one, which to you, best explains its meaning, as in the sample.

Sample: What do we mean by "Shake a leg"?
—1. Exercise yourself
—2. Won't you shimmy for me?
—3. Act quickly
—4. Get a move on

Begin with No. 1 and keep on doing all the others until time is called.

Let George Do It means
— Pass the buck
— Avoid accepting responsibility
— Let George try if he wants to
— To get away with it

He Has a Screw Loose means
— He needs to be mended
— He isn't quite sane
— He is a hunk o' cheese
— He is dippy

Come Thro' with the Goods means
— Deliver them to our house
— Cough up
— Give me your money
— Snow again

Dig a Little Deeper means
— Contribute
— Fish up
— Make a bigger hole
— Call him down

They Handed Me a Lemon means
— They gave me a yellow fruit
— They slipped one over on me
— They satisfied my thirst
— They handed me the straight dope

Come Out of Your Trance means
— Step on the gas
— *Wake up*
— Perhaps you're only dreaming
— Go up in the air

DON'T CRY OVER SPILT MILK means
— A watched pot never boils
— The dish ran away with the spoon
— Don't cry over little things
— Don't worry about things you can't help

FORGET IT means
— Shut up
— Don't mention it any more
— Try not to remember it
— Fall for it

SHE'S PULLING YOUR LEG means
— She's making you taller
— She's got your number
— She's trying to get something
— She's working you for something

TELL IT TO SWEENEY means
— Pass on the news to Sweeney
— I don't believe you
— Don't kid the goldfish
— Get wise

GO TAKE THE AIR means
— You look a little faint
— Slow down
— It's time to leave
— Get off me lip

THEY'RE STUFFING HER means
— They're hitting the ceiling
— They're feeding her a lot
— They're kidding her
— They're deceiving her

BIRDS OF A FEATHER FLOCK TOGETHER means
— Hunger is a dangerous companion
— Pretty maids all in a row
— Good company makes short miles
— You are known by the company you keep

THIN IN THE UPPER CRUST means
— Haven't much brain power
— The pie isn't baked enough
— He's cracked
— To bark up the wrong tree

TO GET ALL THE DOPE means
— Collect the information
— To be a cocaine (drug) victim

— Round up the goods
— To land in the jug
He Led Me a Merry Chase means
— We had lots of fun together
— He strung me along
— He is on the level
— He kept me guessing
Where Do You Hang Out? means
— Where is your clothes' line?
— Where do you live?
— Where do you bunk?
— Are you talking through your hat?
How Do You Get That Way? means
— What made you reach that conclusion?
— What have you done to yourself?
— What's eating you?
— Your face, only a mother could love
Give 'Em the Razz means
— Make yourself solid with them
— Rub it in
— Turn on the victrola
— Tease them
Take the Maggots Off a Blind Man's Eye means
— To be close-fisted
— To be kind to an unfortunate man
— To be stingy
— To freeze out
He Is Going To Take a Ride means
— He is going to jail
— He is going out in his car
— They will put him in the cooler
— He has to ride the goat
Rome Was Not Built in a Day means
— I've been to London to see the queen
— In time, one man's loss is another's profit
— Better a day too soon than a minute too late
— It takes time to produce anything of value
Now You Spring Something means
— Its up to you to wobble now
— Don't monkey with the buzz-saw
— Its your turn to tell a story
— Press the button
He's Nuts means
— He's loco

— He is very foolish
— He likes to go nutting
— He'll pass in his checks

Speel 'Em Off means
— To say them one at a time
— To take the skins off
— Let her shoot now
— Cut out the rough stuff

I Got the Can Tied to Me means
— They gave me the grand bounce
— There's a tin fastened to my belt
— I didn't do her nothing
— I have been dismissed

Bag Your Head means
— Keep quiet
— Shut up
— Put your cap on
— Lay down and die

Pipe Down means
— Keep still
— Lay your pipe down
— Put on the brakes
— Can the comedy

He's Niggin' means
— He's a negro
— He is cheating
— That's slight of hand stuff
— He's pulling the wires

Make Hay While the Sun Shines means
— Make friends, they increase your joy
— He who sings drives away sorrow
— Make the most of your opportunities
— The sheeps in the meadow, the cows in the corn

Cut It Out means
— Don't do it any more
— Sneeze out of it
— Chuck it
— Use a knife

By the Skin of His Teeth means
— Just by a narrow margin
— His teeth are decaying
— It's a close shave
— Hitting the high spots

BEAT IT, BUM means
- Shake the rug
- Go away
- Make tracks
- Give him a knock-down

NOBODY HOME means
- The family has gone out
- He is feeble-minded
- They froze him out
- He is loose on top

TO GIVE HIM THE SACK means
- To fire him
- To give him a bag
- To make him give up his job
- To hand him one

IT'S THE CAT'S MEOW means
- He is most important
- He is mewing like a cat
- He's the cat's Aunt Maggie
- He'll put a crimp in the cat

HE DISHED ME means
- He took my place
- He put me in a pan
- He jipped me
- He side-stepped me

SHOW YOUR SPOTS means
- You've got the chicken-pox
- How's your jack?
- Let's have your money
- Start something

THERE'S A YELLOW STREAK UP YOUR BACK means
- Your coat is in need of brushing
- You are not on the map
- You are a coward
- You haven't the nerve

A BIRD IN THE HAND IS WORTH TWO IN THE BUSH means
- Better be content with little than gamble for more
- An hour tomorrow is worth two today
- One crow does not make a winter
- He will hide his head under his wing, poor thing

HE'LL PUT OUT YOUR WINDOW LIGHTS means
- He will break your auto lights
- He intends to blind you

— He will biff you one in the eye
— He will give you the go-by

To Dope It Out means
— To think it over
— To ladle
— To get the hang of it
— To knock you dead

Half a Loaf is Better than None means
— Be satisfied with what you can get
— Bread is the staff of life
— Better poor with honor than rich with shame
— When she got there the cupboard was bare

See That Jane means
— I wish you'd hush
— There goes Jane, look!
— Look at the young lady
— Turn your lamps on the dame

Pull It Over means
— Throwing the monkey-dust
— Give it the once-over
— Close the lid
— Succeed in doing it

Lay Off That Stuff means
— Cut it out
— Place that material down
— Hold your horses
— Don't do it any more

To Walk a Chalk Line means
— To go straight
— To practise for the tight-rope
— To lead an honest life
— Don't fail me

Watch Your Step means
— Be careful
— Look where you are walking
— Keep your eyes peeled
— Some baby!

SAME-OPPOSITES

Look at these two words: yell . . . . holler   Same   Opposite

They mean the same, so a line has been drawn under Same.

Look at the next two words: long . . . . short   Same   Opposite

These two words do not mean the same; they mean just the opposite, so a line is drawn under Opposite.

Now look at all the other words on the page. If the words of a pair mean the same or nearly the same, draw a line under Same. If they mean the opposite, draw a line under Opposite. If you can't be sure, guess.

cold	hot	Same	Opposite
dragged-out	all-in	Same	Opposite
stall	jostler	Same	Opposite
razz	tease	Same	Opposite
hand-out	food	Same	Opposite
duck	disappear	Same	Opposite
dinky	nice	Same	Opposite
cop	bull	Same	Opposite
bonehead	bright	Same	Opposite
buck	plunk	Same	Opposite
crust	timidity	Same	Opposite
Murphy	potato	Same	Opposite
shyster	swell lawyer	Same	Opposite
suds	beer	Same	Opposite
bitter	sweet	Same	Opposite
take	accept	Same	Opposite
broad	man	Same	Opposite
fobber	fob-worker	Same	Opposite
poor prune	poor fish	Same	Opposite
hot dog	weenie	Same	Opposite
crust	nerve	Same	Opposite
rubberneck	deadhead	Same	Opposite
scratch	small change	Same	Opposite
slippery	easy mark	Same	Opposite
slang	watch-chain	Same	Opposite
flivver	tin-lizzie	Same	Opposite
tog	coat	Same	Opposite
stag	married	Same	Opposite
command	obey	Same	Opposite
flunk	succeed	Same	Opposite
poke	pocketbook	Same	Opposite
ancient	modern	Same	Opposite
wire	tool	Same	Opposite
low-down	classy	Same	Opposite
to lift	to pinch	Same	Opposite
hootch	moonshine	Same	Opposite
bestow	confer	Same	Opposite
rattler	trolley	Same	Opposite
dub	innocence	Same	Opposite
sky pilot	crook	Same	Opposite

whopper	lie	SAME	OPPOSITE
pickled	drunk	SAME	OPPOSITE
amiable	surly	SAME	OPPOSITE
cinch	snap	SAME	OPPOSITE
socking	hitting	SAME	OPPOSITE
pasteboards	cards	SAME	OPPOSITE
booster	hyster	SAME	OPPOSITE
rube	shark	SAME	OPPOSITE
lounge-lizard	cake-eater	SAME	OPPOSITE
prop-getter	stone-getter	SAME	OPPOSITE

CLASSIFICATIONS

Write the letter S under every word that is used in SMOKING.

Write the letter G under every word that is used in GAMBLING OR CARDS.

Write the letter D under every word that has something to do with DRINKING.

Write the letter T under every word connected with some form of THIEVING.

Write the letter F under every word that has to do with FIGHTING.

Write the letter A under every word that has to do with GETTING ARRESTED.

Write the letter W under every word that has to do with WOMEN.

Write the letter C under every word that has to do with CRAPS.

1. nicked, moll, four-flushing, jimmying, sand-bag, whopper, salt-creek.
2. deal, dead-head, snitched, booze, skirt, Little Joe, moll-buzzer.
3. slacker, nicotine, pulled, kick, scalaway, dive, rough-house, flivver.
4. weed, cinch, biff, snoozers, petticoat, fag, boister, rye, beak.
5. gorilla, pickled, coco, wollop, bad fall, bull, white line, hock.

6. Paddy's cabbage leaf, pennyweighter, pinched, broad, Come Phoebe.
7. Hen Medics, boot-legger, damper-getters, flush, tin-horn.
8. burglar, slugger, three-fingered, shimmy-shaker, swop, raisin.
9. jelly-bean, wren, stewed, punch, hoister, slugged, lamaster.
10. salve, flounces, pulled, spieler, mob, carousing, gopher-man.

11. magistrate, mugged, settled, screw, to be loaded, spook, peach, Come 7.
12. African Golf, stalling, Black Maria, fixer, female, black-jack.
13. porch-climber, toper, roll 'em bones, full house, rumbler, bracelets.
14. lammed, jay-walker, snitched, flossy, jazz, irrigate, date, lifer.

15. bammed, Fatima, hock, all blue, lambaste, sock soused, Sleepy-Hollow.

16. skirt, track No. 13, G. & W., brainstorm, trusty, jag, rappers, timer.
17. meerschaum, stagger, Baby needs shoes, camisole, trumps, injure.
18. coffin-nail, whiskey, phizog, chicken, anchor, dice.

OLD AND NEW METHODS OF TEACHING PRIMARY READING

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The opportunity for this study was afforded by the fact that in Athens County two distinctly different methods of teaching primary reading, the one recent and scientifically grounded, the other older and not based on recent research, were being employed.

Any method which is today accepted as psychologically correct for teaching beginners to read should emphasize content rather than form; should call for thought as well as the more purely mechanical processes and should appeal to the child's imagination while it satisfies his natural craving for a story. That the aims of primary reading may be accomplished and efficient reading habits instilled, it is very important to have books which are attractive and which provide scientific and well balanced teaching methods carefully worked out in connection with real children's stories of high literary quality. Even the illustrations of modern texts have a very definite bearing on their usefulness.

The new methods, one of which was in its first year of use in Athens County, meet these demands very adequately.[1] Their readers, charts, flash cards and manual for teachers were published within the past few years in order to provide material in keeping with the results of the latest investigation in the field of teaching reading.

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[1] The new method referred to is the Story Hour, published by the American Book Company.

The older methods published earlier are more purely formal with the emphasis largely on phonics. The content is such as to be relatively uninteresting to the child mind, being made up of many short sentences composed to afford exercise of the phonetic combinations presented. The illustrations are in black and white, and costumes used are out of date. Word phrases which the child should learn to see and grasp as single units are broken up to meet the demands of the mechanical bookmaking.

The problem, then, was to ascertain and prove by means of standardized tests, whether children taught in a modern way, with attractive books, providing interesting content, really made more efficient readers than those taught in the older, formal manner with the emphasis practically all on the mechanical side.

For the purposes of this study, three schools of each type were selected. Those using the older methods will be designated as Schools A, B and C; those using the newer, as X, Y, Z. First grades chiefly were studied, but one third grade comparative study was included.

It was planned to give, at the outset, intelligence tests in all the schools studied, in order that the ability of the children taking the reading tests would be known. In this way it was felt the reading ability developed in the several schools, as shown by the results of the tests, could be more intelligently interpreted when considered in connection with the mental ability of these same schools.

The tests for mental ability—Detroit First Grade Intelligence and Pressey Primary Classification, were given early in January and reading tests, Haggerty Sigma I and Stanford Primary, Form A, were given the last of April, near the close of the school year. The tests except for the third grade, were all given by the same person. In every case, if the conditions under which they were given could not be identical, an effort was made to see that schools A, B and C had the advantage. The teachers in schools X, Y and Z were handling their method for the first time, while the teachers in schools A, B and C had all had at least one year's experience in the method they were using.

It was realized at the outset that there were many things of value which could not be measured and would therefore leave this report tentative and incomplete. Such significant factors as the teacher's personality, the enthusiasm of the children, the correctness of the habits they form, their rate of silent and, in most cases, oral reading—none of these are dealt with in this study. We have attempted here a measure only of the native ability of the children and of their ability to comprehend what they read.

It was first planned to contrast schools A and X because the teachers had much the same experience and training. Both were rated as rather above the average. Schools B and Y were to be contrasted because their conditions were very similar, the teachers had about the same experience and training, each had one grade and both schools were in mining communities. Schools C and Z were two-room schools, each teacher having four grades in her charge. They were unlike in that C was a mining district while Z was agricultural.

Because the teacher is so significant a part of the school and determines so largely what may be accomplished with any method, data concerning the experience, amount of training and success of the teachers in the schools being studied are given in Table 1. Detailed study of the facts about the teachers shows that favorable and unfavorable conditions were more evenly balanced than studied prearrangement often produces.

Table 2 shows the true median group intelligence quotients for the different schools as established by the Pressey and Detroit tests. The Detroit test, when used as directed by its authors, classifies children into fast, average and slow moving groups. A GIQ (group intelligence quotient) for this test was obtained by finding a true median from the scores of 273 children tested in the city of Athens and Athens County, and then

TABLE 1

Experience, training and success of teachers

SCHOOLS	YEARS EXPERIENCE	HOURS TRAINING	RATING BY SUPERINTENDENT
A	12	32.5	Above average
X	22	36	Above average
B	1	66	Average
Y	1	89	Above average
C	2	47	Below average
Z	1	48.5	Average

dividing each score by the median thus found—36.6. The resulting GIQ's are higher than those from the Pressey test, which can be accounted for because the median was established from local cases only and because while the Detroit is a test designed to be given in September to children just entering school, it was given here in January with the result that scores were a little higher, no doubt, than if the test had been given in September. Except for comparison with Pressey medians, Table 2, which shows that in most cases they confirm the Pressey results, no further use will be made of the Detroit results in this report.

TABLE 2

Median GIQ

SCHOOL	NUMBER OF CASES	PRESSEY	DETROIT
A	35	94	101.5
X	11	90.9	102.8
B	34	90.3	103.5
Y	21	91.5	105.5
C	5	79.5	79.5
Z	6	109.5	119.5

It will be noted that GIQ's in general are low, indicating very clearly that the level of native mental ability with which the teachers worked was probably below standard. The scores obtained from the reading tests could therefore not be high.

In considering the results of the reading tests, it seemed most significant to find both the median and the average scores, of which records are made in Table 3.

TABLE 3

Median and average scores of reading tests

SCHOOL	HAGGERTY READING			STANDFORD ACHIEVEMENT A		
	Number of Cases	App. Mdn.	Average	Number of Cases	App. Mdn.	Average
A	34	7	7	28	5	6.3
X	10	6,5	6	7	4	4.1
B	31	3	3,5	24	3	3.5
Y	18	9	10,16	18	5	6.6
C	5	2	2,8		Test not given	
Z	5	9	11,6	7	4	9.5

To place the results of measurements of reading ability on a more readily comparable basis, the per cent of cases in each school with GIQ's below 100 was ascertained from Pressey Primary; also the per cent of cases that ranked, according to the Haggerty standard, at standard and above first grade reading ability. If any group of pupils has a large per cent testing below 100, this of course means a more difficult task for teacher and method to bring such up to standard or above in reading or other achievement. Therefore we have computed the per cent below 100 in mental ability in order to facilitate comparison. The Standard Achievement reading medians and averages as will be learned from Table 3 are directly comparable with the same values for the Haggerty tests. They demonstrate much the same direction and amount of differences. Because of the absence of standards for first grade children and of results for school C in which the Stanford tests were not given, later detailed comparisons will be made in terms only of the Haggerty reading tests.

TABLE 4

Per cent at and above standard in reading and per cent below in intelligence

SCHOOL	PER CENT AT AND ABOVE HAGGERTY STANDARD	PER CENT BELOW 100 GIQ PRESSEY
A	66	85
X	40	75
B	15	86
Y	77	76
C	20	100
Z	83	33

Table 4 shows the per cent in each school ranking above the standard established by Haggerty as normal first grade reading ability.

School A, with 85 per cent below 100 in GIQ's, using the old method, succeeded in teaching reading so that 66 per cent rank, according to Haggerty, at standard and above for first grade ability. School X with 75 per cent below 100 in GIQ's, produced 40 per cent at standard and above in reading ability. This case taken alone, shows the superiority of the old method.

School Y, with 10 per cent higher intelligence than School B, using the modern method, produced 62 per cent more readers measuring at standard and above. That is, School Y shows 77 per cent at standard and above in reading ability, while School B shows 15. It will be remembered that both these schools are in mining communities, and that there is a difference of only 10 in percentage of GIQ's below 100.

While between schools C and Z there is a wide difference in mental ability—100 per cent below 100 in GIQ's in school C and 33 per cent in school Z, there is an even greater difference in reading ability. School C had 20 per cent at standard and above as contrasted with 83 per cent at standard and above for school Z.

In the last two pairs of cases the evidence is strongly in favor of the modern method.

Schools A and Y also should be compared with each other, as A and X with each other, because in these two schools we we find rated equally high teachers in each method and each is located in more comparable communities industrially.

Careful comparative study of Table 4 shows school Y to excel school A in both reading achievement and mental ability, but somewhat more in reading ability. The same results are obtained if schools B and X are compared, though in this case there are not the same facts about teachers and communities for making the comparison.

If we average the three new method schools in per cent at standard and above first grade reading ability, we find them 66 per cent standard and above to contrast with 33 per cent for the old method schools. Treating the per cent with intelligence quotients below 100 in the same way, we find the new method schools with an average of 61 per cent below to contrast with 90 per cent for old method schools. This means that new method schools, with an advantage of 29 per cent in ability, show results 33 per cent better in reading achievement.

STANDARD	NEW METHOD SCHOOLS	OLD METHOD SCHOOLS	NEW METHOD ADVANTAGE
Average per cent standard and above in reading ability.....	66	33	33
Average per cent below 100 in IQ......................	61	90	29

No study like the present one is complete which does not include finally the investigation and treatment of individual children. The next step, therefore, was to select all those children having identical Pressey GIQ's. Those from the new method schools were grouped together and the average Haggerty reading score of 9.6 obtained. Children with identical GIQ's, but taught in old method schools, have an average Haggerty reading score of 4.8. To be sure, the number in each group is small,13 in the new method and 18 in the old. This method of dealing with individuals of the same mental ability seems to us so much more fair and convincing that we are disposed to give considerable emphasis to it and results obtained by it. Our findings to date would indicate that new methods of teaching reading are about twice as efficient as the old.

A third grade in Athens County which had used the old reading method since entering school was able to secure the new method text and some materials for use during the second semester of the school year 1924-25. The teacher and supervisor, in conference before the new books arrived, agreed to let the fact that the class was beginning a new book motivate an active campaign to improve the quality of their reading. The children were told of the plan and urged to put forth effort to see how much improvement could be made in a given time.

A record of the mental ability of the class had been secured about a year earlier by the use of the Pressey Primary group test for intelligence.

A standardized test was used to determine whether there was a growth in reading ability. The Stanford Achievement Primary, Form A, was given at the beginning of the period of especial endeavor and Form B at its close, six weeks later.[2]

The same tests, Pressey Primary Classification and Stanford Primary A and B, were given on approximately corresponding dates to another third grade where no particular campaign for improvement was being instituted. This group was to serve as a check or control and, representing the usual traditional procedure, help to show whether arousing in the children of the experimental group a conscious desire for improvement and stimulating them with new material and carefully planned drills brought about increased ability to read. Hereafter in this paper the third grade in which the definite conscious attempt was being made to improve reading will be called the experimental, the other, the control group.

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[2] We are indebted to Dorothy J. Slutz, graduate student, for giving, scoring and working up the results of these Stanford Achievement tests.

In the experimental group each child's silent reading rate was ascertained before the new book was begun. Tests to determine rate were repeated at intervals of two weeks. Informal tests for comprehension were made frequently.

The eye span of these children was at first very limited. They seemed actually unable to see more than a word at a time. So an effort was made to widen the eye span by using flash cards with word groups. Games using word group flash cards were employed. As a part of the preparation for each lesson in the new book, phrases and word groups were drilled upon, usually in the spirit of a game and after their meaning had been learned. To aid in the development of the weakest cases, a series of phrase books was prepared. Each book consisted of ten phrases. The books were graded in difficulty from that of the Primer to the Third Reader. When a child could make a perfect score in one book, as the phrases were flashed for him, he was permitted to try the next.

The teacher and the supervisor held conferences each week, studying the progress being made by the group and individuals, diagnosing difficulties and planning remedial measures.

The children in the control group had also used the old reading method from the time they started to school. Somewhat prior to the time of our comparative study they were using new method readers as supplementary material. The experimental school had had no such supplementary material before this period of experimentation began.

In the control school no effort was made to arouse in the children a conscious desire to "beat their own record". The teacher was left largely to her own resourcefulness in planning and motivating her work.

The results of the tests of mental ability indicate that the control school stands somewhat higher. The approximate median of the Pressey group intelligence quotients for each third grade is: experimental, 85; control, 91.

The results of the Stanford Achievement reading test are in agreement with those of the intelligence tests, the experimental grade having lower scores than the control grade, the approximate median scores of the former being 19 in Form A and six weeks later in Form B, 36; in the latter, 35 in Form A and in Form B, 40.

The experimental grade contained many retarded children. Their chronological ages ranged roughly from eight to fourteen years. This made quite a difference in computing the Educational Quotient from these scores. The Educational Quotient (EQ) is obtained by dividing educational age as found by test by the chronological age, and multiplying by 100 or in exactly the same way as the intelligence quotient is obtained. The median EQ's of the two schools is as follows:

	Third Grades	*Form A*	*Form B*
Median EQ's	Experimental	79	82
	Control	90	91

The control grade gained 1, and the experimental, 3 points in median educational quotient. It is very interesting to note the number of cases with higher scores and educational quotients (EQ's) on the second test. In the experimental group, 80 per cent of the children made higher scores on the second reading test than on the first. In the control group 43 per cent of the scores were higher on the second test. The EQ's for the two grades show that in the experimental 85 and in the control grade 47 per cent gained on the second test. The evidence of gain in ability to read as measured by the Stanford test is clearly greater in the experimental group. This gain, it should be emphasized, was made by less able pupils by means of definite motivation, drill, a new method psychologically determined, by a teacher of no more than average ability, but willing to cooperate fully with a trained supervisor.

The rate of silent reading was not measured in the control grade. This was done at frequent intervals in the experimental grade. While, therefore, no comparative results can be given, it is significant to find that as in other elements of reading ability, this experimental third grade at the first ranked well below standard. Only 25 per cent were at or above standard for rate of silent reading as given by Courtis for the third grade. This standard is 135 words per minute. At the close of the six-week experimental period, 54 per cent were at or above this same standard. Inasmuch as this gain in rate agrees in both direction and amount with the other measures of reading ability we may conclude again that our experiment was successful and worth while.

Summary of Results and Conclusions

1. Except in one instance every comparison of two first grades, the reading achievement of the children who had learned by the newer and more scientific psychological method was superior. There were as a matter of fact strong unfavorable conditions in this one instance which could well cancel the greater efficiency of the newer method. Though the native mental ability of the grades using the newer methods happened to be higher, the reading achievement in those learning by the newer methods was higher yet.

2. Individual children having the same mental ability as determined by tests when learning to read by the newer method show about twice the reading achievement of those learning by the older methods.

3. A third grade selected for definite experimental procedure consciously set to use the new method with all its appeals to favorable mental and physical processes involved in learning to read made a considerably greater gain than a control third grade which, except for incidental supplementary reading work, made no use of the newer methods. This gain was made in the face of a lower average mental ability in the experimental grade. There were also other adverse conditions. A six-week period is not too short to demonstrate what a new method supplemented with definitely working motivation of teacher and pupil can accomplish.

4. The silent reading rate was so increased that more than

twice as many pupils reached or exceeded the standard rate of 135 words per minute.

5. This study would have been most difficult, if not impossible, without the work of the supervisor of primary reading. The training of teachers in newer and better methods, the giving of tests, scoring and working up results, advising and inspiring teachers and pupils to higher achievement, all this and more, can come most readily for rural, as it has for city children only through scientific supervision.

6. In several earlier attempts to investigate the efficiency of supervision and the newer methods of learning to read, no definite tests of native mental ability of the children were made. Starch summarizes admirably (Ed. Psych., Chap. 16) the methods and results of the studies of the effectiveness of special methods of teaching reading. He rightly concludes, as we do in this study, that there are many complex factors involved and that no final conclusions can be drawn.

The Indiana experiment of gains through supervision of rural schools in two counties with two other counties used as controls shows clearly improvement in achievement in reading and other subjects.

In none of these investigations just mentioned was there an attempt made to determine the mental level of the children on whom various methods and supervision were used.

Gray in his excellent and thorough Summary of Investigations Relating to Reading (University of Chicago, 1925), reports results of studies of the relation of intelligence to reading achievement. Such workers as True, Madsen, Merrill and Hewes with grade and special class pupils and Webb with college students find a greater or less degree of positive agreement between general intelligence and reading achievement. Theisen, Oglesby, Lowell, Dickson with younger pupils and Sangren and Patrick with older pupils and college students demonstrate that progress in reading depends to a considerable extent on the level of intelligence of the learner and also, what is more germane to our work, that further experiments are needed to determine the most appropriate types of instruction for pupils of various levels of intelligence and at various levels of school progress.

If our own first results of measuring efficiency of newer reading methods as against older ones seem to the reader unconvincing, may we hope that he can approve of a method which first requires that the mental ability of children be ascertained before undertaking to determine the advantages of various methods of training. In so concluding, it is by no means necessary to assume that the intelligence tests used by us were perfect measures of the mental ability of our children.

THE PERCEPTIBILITY OF AUTOMOBILE LICENSE NUMBERS

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In the last few years the numbers of automobiles have been increasing so rapidly that in several states they have passed the million mark. Each car carries a license plate with a number and since the cars have become so very numerous these license numbers have become quite cumbersome and difficult to read.

It seems that psychology ought to be able to find a way to simplify and clarify this situation. Theoretical studies in perception have been carried on for many years, and especially in regard to reading has valuable knowledge been gathered. Some of these known facts might now be applied to the automobile license problem.

The immediate introduction of the writer to this question was brought about by a study at Columbia University for his Master's thesis on "The effect of grouping upon the perception of digits." He found in this work, much to his surprise, that the 3–3 grouping of a series of six digits was inefficient and tended to error. This finding immediately suggested automobile license plates where the 3–3 grouping is often seen. As the Columbia work was done with a small tachistoscope, the digits used being typewritten and exposed at a distance of 3 or 4 feet, the conclusions could not be applied to automobile license numbers without further experimentation.

The present investigation was started to test the effect of grouping with actual automobile license numbers, but developed into a study of the effect of using letters on the license plates with the numbers.

The apparatus used in the experiment was a special tachisto-

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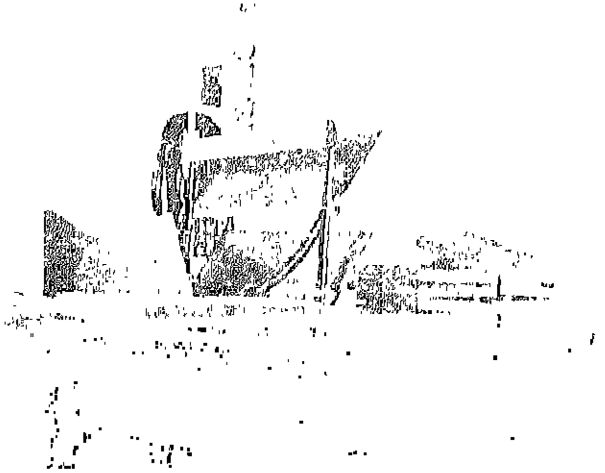

FIG. 1. REAR VIEW OF TACHISTOSCOPE, SHOWING BOTH DOORS PARTIALLY LOWERED

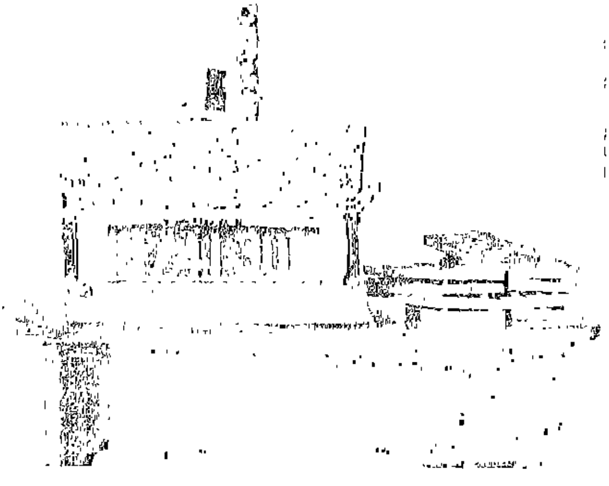

FIG. 2. FRONT VIEW, DURING THE EXPOSURE

scope designed by the writer. It consisted of two doors hinged horizontally and mounted the one above the other. In operation the bottom door would drop, exposing the numbers, and pull the upper door, by a cord, after it, ending the exposure (see the pictures). The exposure time used in this experiment was approximately one-fifth of a second. It was not measured accurately, but was kept constant throughout the whole experiment so that for comparative purposes the results are entirely reliable.

The particular digits shown in each exposure were selected by chance. Digits 1, 2, 3, 4, 5, 6, 7, 8, 9 and 0 were written on small cards and shaken up in a box. The requisite number of cards for the exposure were then drawn out and the digits written on them taken in their order.

The automobile license numbers were furnished by the Pennsylvania State Bureau which had charge of their manufacture and were identical with the numbers used on the Pennsylvania automobile license plates. The numbers were sent separately, however, so that the order of presenting them could be changed.

The letters used in the experiment were purchased in a hardware store. They were a trifle smaller than the numbers but it was judged that the difference in size was too small to materially affect the experiment. The letters and background were painted the same colors as were the digits and their background (yellow background, blue letters and digits).

Before every experiment a series of exposures was prepared. Either the digits, or digits and letters were mounted by a pre-arranged scheme upon boards 6 inches wide which in length just fitted the tachistoscope. During the experiment one of these boards was slipped in place, the ready signal given, the exposure, and then the board was taken out and another one with a different grouping put in its place. The groupings were shown twice, in chance order, during each experiment.

The subjects were a group of college men, largely of the Junior class who were taking a course in Applied Psychology. Their coöperation was good. The regular class situation and laboratory periods were used. The experiment was carried on in a large room the men being from 15 to 25 feet away from the tachistoscope. The men kept the same seats throughout the whole experiment to make the results accurately comparable.

The actual experimentation was done by two senior men Borda and Gorgas. These men also did the major work in compiling the results.

The first half of the experiment dealt with the grouping of the digits and will not be quoted here as the differences between the groupings under the conditions in which the experiment was made, were not great enough to be very significant. Six digits as a single group appeared the best, but it seemed that results of greater reliability and usefulness ought to be available.

It was at this point that the idea developed of using letters. Previous tachistoscopal work had indicated that letters combined in meaningful syllables or words were much more perceptible than digits. Why then, should letters not be given a numerical significance and used in numbering automobiles?

Below the results are given of a test of this hypothesis. A brief preliminary experiment showed that the accuracy of report with digits up to five in number was as high as 90 per cent. Letters were then introduced in nonsense syllables and small words. The combinations used were as follows.

Letters	Numbers	
0	6	
0	5	
3	3	
3	3	(numbers first)
3	4	
4	2	
5	2	
1 digit—1 letter—4 digits		(New York Plan)

More combinations could well be used to make the experiment quite complete, and probably will be next year. The results obtained were sufficiently decisive, however, to justify conclusions which seem to the writer of considerable practical importance.

Some sample exposures are given below with the percentage of correct responses, as found in the experiment.

"Correct" means the whole number was recorded without error.

"Exposures" means the number of combinations used (50684; one combination) times twice exposed, times the number of subjects who recorded. (The two exposures were separated by exposures of other combinations to eliminate memory responses.)

6 digits. 56 per cent correct. 200 exposures.
Samples: 473926
081576
350204
726358
5 digits. 90 per cent correct. 680 exposures.
Samples: 50684
48602
62408
13758
3 letters—3 numbers. 70 per cent correct. 400 exposures.
Samples: DIM125
MAY461
TIK058
BEL291
3 numbers—3 letters. 76 per cent correct. 288 exposures.
Samples: *543BAD*
103PET
195KOB
462MUT
3 letters—4 numbers. 45 per cent correct. 720 exposures.
Samples: PUD7145
DOT6309
SOL3618
BUD1603
4 letters—2 numbers. 85 per cent correct. 266 exposures.
Samples: BALD19
PALE46
TIDE35
BAKO19
5 letters—2 numbers. 75 per cent correct. 330 exposures.
Samples: BATUK06
DOUBT82
MOLDY73
LIMED56

In the above exposures there was a small space allowed between the letters and digits, but it was not a full space and cannot be shown with a typewriter.

1 digit—1 letter—4 digits. 35 per cent correct. 260 exposures.

Samples: 2B 70 64
41 95 18
9A 37 54
7M 36 06

Letters	Numbers	Per cent correct
0	6	.56
0	5	.90
3	3	.70
3	3	.76 (reverse)
3	4	.45
4	2	.85
5	2	.75
1 digit—1 letter—4 digits		.35

This experiment will be carried on further to get more refined results, but the figures quoted here show plainly the high perceptibility of letter groupings.

It merely remains to evolve some plan of giving numbers a numerical significance to show their utility for automobile license plates. One simple plan using the experimental data given above might be as follows.

99,000	5 digits
519,948	1 letter and 4 digits
419,580	2 letters and 3 digits
4,305,590	3 letters and 3 digits
4,365,900	4 letters and 2 digits (not exhaustive)
10,914,750	5 letters and 2 digits (not exhaustive)
20,625,757	total

99999 cars numbered with digits alone.

1 letter and 4 digits used to number 26 (letters) times 9999 times 2 (the letter used both before and after the digits.) This would number 519,948 cars.

2 letters and 3 digits. 21 letters times 5 vowels times 2 (AB-BA) times 999 times 2 (letters used before and after the digits). This would number 419,580 cars.

3 letters and 3 digits. 21 consonants times 21 consonants times 5 vowels times 099 times 2 (letters used both before and after the digits). This would number 4,305,590 cars.

4 letters and 2 digits. 21 consonants times 21 consonants times 5 vowels times 5 vowels (abet) times 2 (bate) times 99 times 2 (letters used before and after the digits. This would number 4,365,900 cars but is not exhaustive for the four letter and 2 digit combination, as the last consonant could be doubled (bett) and many small words were not counted, beam for instance.

5 letters and 2 digits. 5 vowels times 21 consonants times 5 vowels times 21 consonants times 5 vowels times 99 (ababa) times 2 (letters used before and after digits). This would number 10,914,750 cars and is by no means exhaustive for the combination.

A scheme as the one suggested could be completely worked out to number the cars of any state or nation and the system would easily take care of more than twenty million cars. A 25 per cent increase of efficiency in perceptibility over 6 digit license numbers should be found with all the new numbers and a much greater than 25 per cent improvement with many of them. The scheme would be applicable also to numbering freight cars, or any series of things where quick and accurate perceptibility of the number is desirable.

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NOTES AND NEWS

THE AMERICAN HISTORICAL ASSOCIATION

The American Historical Association is now for the first time making a general appeal to the public for coöperation in the raising of an adequate endowment. The Association was founded in 1884 by such men as Andrew D. White, Francis A. Walker, and Herbert B. Adams. The presidency of the Association has been held by two Presidents of the United States—Theodore Roosevelt and Woodrow Wilson. The Association is not an exclusively academic institution. It is the chief coördinating agency of the historical fraternity throughout the country. It has stimulated and guided the teachers of history in elementary and secondary schools. It is now, in view of changed conditions, planning a fresh study of these educational problems.

The Association undertakes to place at the disposal of the Government the resources of historical scholarship. It should be noted that the prizes administered by the Association are given for studies in European as well as American history.

Such work as the Association has already done has been made possible only through an immense amount of unpaid service. What the Association now asks is an increase in endowment from $50,000 to $1,000,000 with the expectation that the additional income thus provided will be used, not only to secure more certain and adequate support for work already undertaken, some of which has been seriously curtailed or delayed by the lack of such support; but also to make possible certain new forms of service.

The time has now come, however, when the Association ought to assume a more positive leadership. We have not had in this country enough systematic effort to direct the attention of investigators toward special problems which need to be solved, whether from the point of view of the historians themselves or with proper regard for workers in the related social sciences, such as economics, political science, and sociology.

Now that the United States has become the most influential of the World powers, there is urgent need for more thorough and dispassionate studies of the history of American international relations (including contacts with Europe, Latin-America, and the Far East). The appeal to history is often made by partisans, but nearly always such appeals involve more or less distortion of the facts. There are few subjects more in need of disinterested research.

A topic much obscured by prejudice and emotional or selfish propaganda is that of immigration and racial elements. Recent legislation brings up questions in which the help of the critical historian as well as of the economist and the sociologist is needed.

Although the Association can always draw extensively upon its members for unpaid professional services, the desirability of having some one devote the major part of his time to directing and correlating its activities is very evident. Funds are needed for the salary of such an official, and also for the rent of offices, or perhaps the purchase and upkeep of a house in Washington to serve as headquarters for the Association and to house properly its accumulating records.

Any one interested should write to The American Historial Association, 1140 Woodward Building, Washington, D. C.

The Southern Society for Philosophy and Psychology

The Twenty-First Annual Meeting of the Southern Society for Philosophy and Psychology met at the University of Kentucky, April 2 and 3, 1926, Dr. J. B. Miner, President, presiding. The program of the meeting was so varied and interesting as to provoke vigorous discussion from the first to the last paper. President Miner's address on The Significance for Psychology of Qualitative Differences was most thoroughly and thoughtfully prepared. It was preceded and followed by discussions of Behaviorism and Systematic Psychology by Drs. Max Meyer, A. P. Weiss, I. Madison Bentley, Knight Dunlap, Herbert Sanborn, Seba Eldridge, Joseph Peterson and other guests and members of the Southern Society. Altogether the proceedings of this Society, at least for this year, will compare favorably with those of the American Association.

At the business session the following resolutions were adopted:

Whereas a study of the teaching of psychology in colleges, state teachers' colleges and normal schools in the South reveals that psychology is taught in a number of institutions by teachers whose training has been inadequate; and whereas the equipment of laboratories, technical periodicals, etc., necessary for proper training in psychology has also been found to be inadequate (conditions which probably do not obtain in the South alone); therefore, be it resolved that:

1. The Southern Society for Philosophy and Psychology hereby appoints a special committee with power to carry out these resolutions, consisting of Professor Joseph Peterson, of the George Peabody College for Teachers, as Chairman, and Professor Buford Johnson, of the Johns Hopkins University; Professor J. B. Miner, of the University of Kentucky; Professor T. K. Sisk, of the State Normal School, Livingston, Ala.; and Professor W. J. Woodson, of the State Teachers College, San Marcos, Texas.

2. That the Society express its disapproval of the teaching of the first year's courses in psychology, educational psychology, and other branches of psychology by anyone who has not had the training represented by at least a master's degree with a major in psychology; and also the teaching of advanced courses in these subjects beyond the first year's courses by anyone who has not had at least the training equivalent to a doctor's degree with a major in psychology.

3. That the Society asks all heads of departments in which these subjects are taught, whenever the question of transfer of credit from other institutions to theirs is raised, to disapprove the transfer of any credit in these subjects not taught by persons qualified as indicated above.

4. The Society asks the above Committee to coöperate with the various institutions and the associations of colleges in every way possible in raising their standards in accordance with the above resolutions.

5. That the Society authorizes the Council to appropriate such sums as are necessary for carrying out the intentions of the above resolutions.

The Brown-Woody Civics Test

The World Book Company has recently published the Brown-Woody Civics Test, designed for measuring the achievement of students in high school civics or in community civics of seventh, eighth, or ninth school years. With the importance attached to citizenship training in schools, it is believed that an objective measurement of the results of civics teaching is highly desirable. The items of each of the three parts have been chosen with great care. Standardization has been experimentally and thoroughly done. This test should prove useful for classifying, measuring class and pupil progress, diagnosis of difficulties of class or student, testing methods of instruction, and the motivating of learning and stimulating of teacher and pupil.

Courses on Home Education and Parenthood and the Pre-School Child

Dr. Garry Cleveland Myers was on leave from the Junior Teachers College of the Cleveland School of Education during the past semester. He offered two courses in Home Education and Parenthood at the School of Applied Social Sciences, Western Reserve University to 136 regularly registered students, of whom 102 were fathers and mothers. Each course carried two semester hours credit and met in two sections. "Education of the Child of Pre-school Age" had 59 students and "Home Education of the Child from Six to Twelve" had 77. The course on the pre-school child is now in its third semester, being offered first in February 1925. The total registration in this course from that date has been 179 students.

The Sachs Prize Awarded

The Committee on the award of the Julius and Rosa Sachs prize of $1000, established at Teachers College, Columbia University, for the purpose of promoting the progress of secondary education in the United States has announced as the winner of the prize for 1926 Dr. Edward Augustus Fitzpatrick, Dean of the Graduate School, and Professor of Education, Marquette University, Milwaukee, Wisconsin. The subject of the essay is: "The Promotion of Scholarship in the Teachers of the Secondary Schools of the United States."

The second annual competition for the Sachs' prize of $1000 has already been announced. The topic of the essay or treatise for this second prize is: "The Aims and Methods of Science Teaching in the Successive States of the Secondary School, and the Intellectual Equipment of the Teacher That Will Enable Him to Put These Aims into Practice." All manuscripts must be in the hands of the Dean of Teachers College on or before December 1, 1926. The rules governing the competition for the Sachs' prize may be secured from the Secretary of Teachers College, 525 West 120th Street, New York City.

Army Alpha Revision

Dean R. Brimhall, Secretary of the Psychological Corporation, 3939 Grand Central Terminal, New York City, has announced a revision of Army Alpha by Dr. Bregman with the coöperation of Dr. Cattell. It is a combination of the five army forms, made to be of average difficulty and to give average scores. The best questions for general use have been selected by order of merit methods, thus excluding those addressed especially to men recruits at a particular time.

The test was prepared especially to be given by correspondence to those who are unable to consult a competent psychologist. Full instructions have been prepared so that any one can arrange to have the test made on himself. A charge of five dollars is made for the test. Material, scoring and a report of the rating made in the test will be mailed to the person concerned.

While the revision was taken up to fill the need for a test that might be given by correspondence, it is apparently the best form of Army Alpha for a group.

One hundred copies with mimeographed instructions can be supplied for five dollars to psychologists associated with the Psychological Corporation. It will not be sold to others.

Professor Norman Fenton, State Teachers College, Tempe, Ariz., has been appointed to an Associate Professorship in Psychology at Ohio University.

Stuart M. Stoke has accepted an appointment to an Assistant Professorship in Psychology in the University of Buffalo.

Dr. Dean A. Worcester has accepted appointment to an Associate Professorship of Psychology at Ohio University, Athens, Ohio. Dr. Worcester was formerly Professor of Psychology and Director of the Bureau of Educational Research in the State Teachers College, Emporia, Kansas. During the present summer he is Assistant Professor of Psychology, Ohio State University.

Dr. George E. Carrothers, Professor of Education, Ohio University, has been appointed Dean of Rollins College.

BOOK REVIEWS

RICHARD B. FRANKEN. *The Attention Value of Newspaper Advertisements.* New York, The Association of National Advertisers, 1925. Pp. 55.

Franken reports a summary of five separate investigations regarding the attention value of newspaper advertisements. Two of the studies were made by Franken at different times, one by Strong, a fourth by Roberts, and a fifth by Hough. In the appendix is presented a bibliography of thirty-four titles on the subject.

The reviewer is naturally pleased to find that the conclusions of his original study made in 1914 are well supported by these four subsequent investigations. In fact the most striking fact in Franken's report is that investigations based on from 25 to 102 persons should agree so well with each other.

A few of the many conclusions may be mentioned. "Although it is not likely that every page in the newspaper is read or even looked at by every person tested, nor that any advertisement, no matter what its size, can hope to obtain 100 per cent attention, nevertheless the results of the tests reported show that even so small a group as 100 typical readers is taken as a whole, some advertisements on every page are seen and recognized by some one person. The poorest page receives an attention average of 3 per cent, while the pages throughout the entire paper, excepting pages 2 and 3, receive the potential average attention of about 5 per cent." But some advertisements were not recognized by a single person tested. Thus does science cool the ardor of the sales promotion manager's talk of 100 per cent efficiency and call attention to the fact that some advertisements are woefully weak.

Another conclusion that is not welcomed by sellers of advertising space is that attention value increases approximately as the square root of the area and not proportionately to the area. This fact, first stated by Hollingworth, seems to be well established now. The effect of preferred position, of reader's reading habits, of position on the page, of the presence of reading matter, of size and shape of advertisements, and many other factors are considered.

One problem that is not discussed is that of the effect of size of the publication upon advertising efficiency. Years ago the reviewer published data showing that the memorability of an advertisement decreased as the number of advertisements seen at one time increased.

Today many advertisers are convinced that a page has not the advertising value it used to have, due to this factor. Here is an interesting psychological problem that needs further investigation.

No one interested in advertising can afford not to consider carefully the results so clearly presented by Franken, and in such compact form.

EDWARD K. STRONG, JR.
Stanford University.

EDWARD K. STRONG, JR. *Psychology of Selling and Advertising.* New York, McGraw-Hill Book Co., Inc. 468 pp. Illustrated.

On the whole, the book fortunately, in a field that already has so many books on psychology of advertising, stresses the principles of psychology applied to *selling*, although it also applies the same principles to advertising as well.

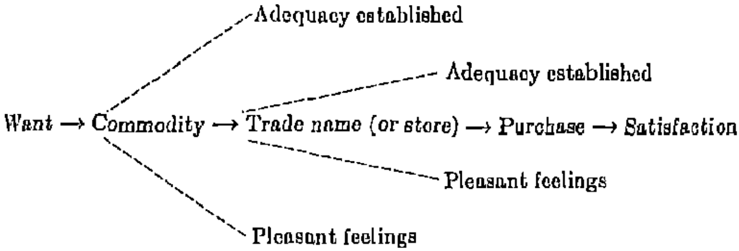
The purpose of Dr. Strong's book is "to supply a working formula in terms of which a seller may not only make each individual sale in an efficient manner, but may also tend steadily to convert buyers into customers." Since the fundamental objective of selling is to make a customer, he considers the psychological problems of selling in terms of permanent satisfaction, developing good will, and converting potential prospects into regular customers. Unless the seller can understand when certain changes have taken place in the minds of his prospects that cause them to have a new attitude toward the product, he cannot succeed in selling.

The book is written and arranged to meet the needs of three groups of people. Leaders in the advertising and selling fields can find all the information they need in Chapters 1 to 6, "General Survey." Sales "cubs" and students should begin by reading Part IV, "Strategy and Tactics of Selling." Business men, wishing to understand the basic factors involved in handling and influencing other people, will find their problem discussed in Part II, "How Man Satisfies His Wants," and Part III, "Principles of Selling and Advertising."

In commenting on changes in selling procedure that have been made in the past fifteen years, Dr. Strong stresses the growing recognition of the buyer's point of view. This change has come about so gradually that many salesmen and advertisers have not yet seen that if they want the buyer to be satisfied and feel good will, they must present their proposition from the buyer's point of view. A concrete instance is of a salesman whose product was a new fashioned ice-box with several patented features. Although the man's territory was in the South, he was not particularly successful until the sales-manager sent an ice-box to his home as a gift. When the salesman used the ice-box, he understood its good points and could make more sales because he had both factory knowledge and intimate contact with it. The salesman had moved away from the trial-and-error method of selling, because he knew what his prospects wanted.

In Chapter 9 is found a discussion on the instruction regarding the commodity that companies give to their salesmen. All companies require some knowledge of the product. This varies from the formal instruction, typical of many companies, to the fourteen months intensive training in its own plant that the Westinghouse Electric and Manufacturing Company gives its prospective salesmen.

The salesman needs to understand that in buying anything, the purchaser's mental steps are "from want to commodity, to trade name, then purchase." When the buyer has used the commodity, he is either satisfied or dissatisfied. If he has found the commodity both adequate and pleasing, the buying formula can be expressed in a diagram, like this:



In the next three chapters the buying formula is exemplified in five analyses of sales—actual interviews between the seller and the buyer. These are sales in the life insurance field, in retail groceries, and in the home. In each instance, the salesmen find the buying formula of value in understanding the mental process of buyer. They are salesmen who have had the four kinds of instruction that all salesmen should have. They are, first, knowledge of the commodity and the policies of his company; second, a knowledge of selling methods; third, ability to carry out the methods; fourth, understanding of his prospects.

Chapter 5 points out that "the solution to each sales problem is implied in the buying formula;" that is, that the same tactics of salesmanship can be used for various prospective buyers, but that emphasis must be shifted. The chapter on "where to put the emphasis" reproduces twenty-five advertisements of well-known products and points out in what respects they do or do not fit the buying formula.

In Part II, "How Man Satisfies His Wants," is given an interesting, non-technical discussion of man's natural wants and his normal means of satisfaction.

Part III, "Principles of Selling and Advertising," discusses motivation, its theory, practise, and technique; also the rôle of memory and the use of appeals.

Part IV, "Strategy and Tactics of Selling," gives clear and comprehensive instruction to salesmen. This section of the book is not intended to take the place of a company sales manual with its discussion of the firm's peculiar selling problems. But it will help the salesman understand more fully what is back of the instructions in his company's manual. There are helpful chapters on prospecting, starting the interview, etc., with helpful suggestions for every step that the salesman has to take. Dr. Strong understands the salesman's viewpoint. In his preface he speaks of having gained a broader understanding of the problems of selling from the several hundred experienced salesmen who have been in his classes.

Since Dr. Strong's book is based upon new objectives of selling that have arisen almost within the past decade, it presents a different view from those of older books on selling and advertising. It has modified old concepts and introduced many new ones. "Psychology of Selling and Advertising" will undoubtedly receive a warm welcome in the business world, for it will be helpful both to corporation heads and to their salesmen, as well as students of sales and advertising psychology. It is written from the viewpoint of both the seller and the buyer, has human interest, is full of concrete examples of the application of psychological principles to sales problems, and is very readable.

Richard B. Franken,
New York University.

G. V. Hamilton. *An Introduction to Objective Psychopathology.* Mosby & Company, 1925. 354 pp.

This book consists of twelve chapters and is divided into two parts. Part one is composed of three chapters: I, Introduction; II, Two Hundred Nervous Cases; III, Summary of the Survey Findings. The description of the 200 nervous cases covers 170 pages, averaging therefore, somewhat less than a page to a case.

Part two is entitled "Principles of Objective Psychopathology," to which the remaining nine chapters are devoted. Chapter IV is another Introduction; chapter V, The Foundations of Psychopathology chapter VI, Neural Morphology, Neural Physiology, Endocrinology; VII, Comparative Studies of Reactions to Baffling Disadvantages; VIII, Habit Formation; IX, The Relation of Inhibition of Responsiveness to Indirect Responsiveness; X, Unsatisfied Major Cravings; XI, Reactions to Inferiority; XII, Sexual Behavior. There is a glossary of unfamiliar terms, a bibliography and an index.

In a foreword, Dr. Yerkes says of the book that it "will be rudely handled by many, neglected by others, greedily devoured and used as a stepping stone to fuller knowledge and the development of methods of observation by a few." A book of which that can be said is most certainly an unusual book. Not only is Dr. Yerkes' statement probably true for different readers, but the same reader will undoubtedly go through all three of those stages in different parts of the book. In other words, it is a very uneven product. There are paragraphs that are valuable and suggestive. There are some that can be neglected and there are some that tend to induce rude handling. One questions whether Dr. Yerkes' well intentioned foreword is really a kindness to the author, for it leads the reader to expect more than he finds.

The author himself says in the preface, "The results of this work are here offered to physicians, social workers, and lay readers." In the opinion of your reviewer, this is too wide a field. One can not generally talk to an audience so widely diversified in interest and attainment. The difficulty of such an undertaking is well illustrated in the type of word the author has felt it necessary to define in his glossary. We find on the one hand, *acroparesthesia*, *angioneurotic Edema*, *fastidium*, *hebetude*, *mediastinal*, *pyosalpinx*. At the other end of the scale we have *aphasia*, *cardiac*, *cervical*, *clavicle*, *coryza*, *femur*, *olfactory*, *patella*, *psychosis*, *sinus infection*, *therapeutic*, *uterus*. Were it not for the statement already quoted, one would certainly be at a loss to guess for whom the author was writing.

The 200 cases are exceedingly varied in interest, in fullness, in the type of discussion, and in value. For example, case 182 is covered in eight words; "Female, Fourth Decade, Hyperthyroidism, no significant adjusted disfunction." The cases are the result of what the author calls a "survey" of the psychopathic cases in a town of 30,000 inhabitants in the Mississippi Valley.

It would seem that the term "survey" which the author uses repeatedly, is hardly appropriate for there is no indication that he made a systematic examination of the 30,000 inhabitants or of any unselected group of them. He spent a year in the town and saw such patients as came to him, or were sent to him by other physicians. So at best, he saw only a relatively few of those who were sufficiently bad off or had sufficient insight to conceive that they might be helped by a physician.

As to the method of treatment, there seems to be nothing new. It might be described as a modified psychoanalytic procedure. His attitude toward Freud and the analyst is perhaps fairly indicated by two quotations. "If I suspect that her inhibition of recall processes is too firmly fixed as a reactive habit to enable her to overcome it by relaxing *and thereby acquiring a noninhibitive reactive set for purposes* of examination I may be compelled to study her dreams, as interpretable indirect reactions; but one rarely encounters a patient who is unable to disclose by *ordinary processes of recall* ample material for an explanation of her nevousness" (p. 207). And again "The family physician who is familiar with the general outline of Freud's teachings is in a far more favorable position to make effective his own methods of dealing with nervousness than is one who must confess that psychoanalysis is for him a *terra incognita*" (p. 208).

In Chapter V the author states "The special foundations of psychopathology are neural morphology, neural physiology, endocrinology, and behaviorism" and again "This book is exclusively concerned with the kinds of nervousness that are not due to any known infection, intoxications or structural changes of the nervous system, that do not require institutional management and that the internist ought, with few exceptions, to accept as coming within his general field of therapeutic and diagnostic endeavor." This chapter is a short but very clear statement of the foundations of psychopathology.

Chapter VI is again rather elementary, devoting itself to an explanation of the neurons, the cell body, axones, etc.

Chapter VII sets forth among other topics, "*The Hamilton Method of Investigating Reactions to Baffling Disadvantages*," and is based upon experimental studies of 31 human subjects, 10 monkeys and baboons, 16 dogs, 5 cats, 1 horse, 1 mouse, 5 gray rats, 4 black rats, 8 albino rats and 6 gophers.

The remaining chapters contain little that is new to the student of psychology and psychoanalysis, though there are many interesting paragraphs and striking sentences. Yet they suffer as does the whole book, in the opinion of the reviewer, from the unfortunate attempt of the author to write one book for both the laymen and the professional.

Although the book probably adds nothing to our knowledge of psychopathology, there is set forth a method based upon Freudianism (but without its mystical interpretations)which will undoubtedly prove of value to students in a certain stage of their development.

H. H. Goddard,
Ohio State University.

Helmholtz's Treatise on Physiological Optics. Translated from the Third German Edition. Edited by James P. C. Southall. Vol. III. Published by the Optical Society of America, 1925. Pp. x, 736 and 6 plates.

The third volume of the third German edition of the *Optik* appeared in 1910, one year before the second volume. The editor of this volume, von Kries, followed the text of the first edition and included extensive notes of his own. The third volume of the English translation follows the text of the third German edition and includes, in addition, two short notes by von Kries, a partial bibliography of some 550 articles which have appeared on vision between 1911–1925, an index of subjects, an index of authors, *corrigenda* in volume II, and additional *corrigenda* in volume I.

This third volume, on "The Theory of the Perceptions of Vision," of Helmholtz's monumental work will be of even greater service to psychologists than the second volume. Here one finds Helmholtz treating of perception in general, monocular and binocular vision, perception of depth, direction and rivalry, and theories; and appendices by von Kries on spatial configuration and questions of innate dispositions and experience. The work stands as a great and unrivalled classic for the foundation of experimental and physiological psychology on the side both of fact and method. The science has still to wait for a work which will begin to do for complex mental processes what Helmholtz's genius and labor did for sensation and perception.

What has already been said about the excellence of the preparation of the first two volumes is equally true of the third. Great credit must be given to Professor Southall and his collaborators for the successful manner in which they have accomplished a difficult and formidable task. Professor Southall wishes that tribute be paid also to Mr. Adolph Lomb whose "noble and singleminded devotion to the advancement of science for the welfare of mankind is so genuine and unstinted that I know he will consider himself amply rewarded if the usefulness of Hemholtz's work is continued and extended by this English edition of the Treatise on Physiological Optics."

C. C. PRATT,
Harvard University.

SEDA ELDRIDGE. *Political Action: a Naturalistic Interpretation of the Labor Movement in Relation to the State.* (Lippincott's Sociological Series.) Philadelphia, J. B. Lippincott Company, 1924. Pp. xviii, 382.

The author states that the work is an attempt to use the methods of investigation, with reference to certain political and economic problems, which have been applied in the fields of education and criminology, for the enrichment of the social sciences. These problems include (1) the relations of the capitalist and the wage-earning classes in the United States, (2) the future of representative government, (3) the struggle of social classes for power, and (4) the use of "direct methods" in the furtherance of group interests.

The method followed throughout has been the analysis of specific situations to determine causal relations of various factors to given situations, which are productive of change. The book presents a statement of the obstacles that oppose the successful operation of democracy. The author dwells on habit, instincts, and the power of the "suggestioning agencies" used by the dominant class as the determining factors in social problems. When the problem of class struggle, for example, is analyzed, it is shown that natural factors having nothing in common with reason produce social conditions. When the hereditary mental equipment evolved under primitive conditions is required to function under conditions of civilized life, the results are unsatisfactory. Neither faction in the class struggle is moved to action by reason and judgment, but each responds to instinctive impulses. No permanent equilibrium between the two forces, therefore, appears possible. Since one faction increases its strength at the expense of the other, "the outcome of the present situation will probably be the complete ascendancy of the one class or the other." The editor in his introduction well concludes "this book is calculated to lead either to a pessimistic conclusion about the future development of democratic society, or. . . . to vigorous efforts to set free those psychic processes which are the essence of democratic action."

The reader is prepared for the presentation of the results of the investigation not only by the editor who points out debatable positions assumed by the author but also by the author who recognizes the proponents of the influence of hereditary mental characteristics and of the results of custom, traditions, institutions, educational discipline, and other environmental factors. The final chapter is devoted to a discussion of these divergent views.

The book will contribute to any reader who desires to adapt himself to his environment and who wishes to learn about himself and his neighbors. It points out a more accurate way of estimating the capacities of people to function in any situation.

EDWIN B. SMITH,
Ohio University.

HANBURY HANKIN. *Common Sense and Its Cultivation.* E. P. Dutton, N. Y., Kegan Paul, London, 1926. viii and 289 pp. $2.50.

The author, a British physician in India, raises and attempts to answer two questions: Can we know more about the nature of common sense? Can its development be "stimulated by any practical changes in our educational methods?"

The book really deals with various problems which are usually grouped under the category of "the subconscious." For Dr. Hankin that is what common sense finally reduces to. So the thesis is presented that all of the important problems in commerce and finance, medicine and education can be solved more quickly and safely by the snap-judgments of the "subconscious" and "preconscious" minds than by the ratiocinations of the third "mind"—the conscious one.

For some reason or other, the author seems quite out of patience with education, particularly with the education of business men, for whom the volume appears to have been written. We read in the preface that "our educational methods, whatever their matter, are fundamentally vicious in their manner" and that the study of foreign languages (p. 200) "is likely to have the disadvantage that his (the student's) capacity for developing the business instinct will be impaired."

Neither of Dr. Hankin's objections—to the artificiality and sinister influence of education and the omniscience of what is called "the subconscious" is new. Rousseau held much the same general point of view, and Hankin's "common sense" looks for all the world like the same thing as Bergson's "faculty of intuition."

The thesis of the volume is supported principally by weak evidence of the anecdotal sort and by unadulterated *ad hoc* logic. For example, we read (p. 54) that "The speed of lightning calculators in producing their results may be compared to the speed with which we arrive at common sense decisions. If we can explain this speed in one case, we may hope to have some clue to its nature in the other."

Prof. C. S. Meyers, who contributed the introduction, says that, "Although as Dr. Hankin admits, the book cannot always claim psychological precision . . . . it will make the reader think." Psychologically the book performs the office of emphasizing, from the point of view of a shrewd "lay" observer, the importance of pushing the *degrading* process in "learning" as near the asymptote as possible where this "learning" is of certain professional or vocational types. Otherwise it is trivial.

Samuel Renshaw,
Ohio State University.

Leonard Darwin. *The Need for Eugenic Reform.* D. Appleton & Company, New York, 1926. 529 pp.

This book may seem at first sight to have a large amount of commonplace material needlessly written, but not so. The author in the introduction says it was not prepared for those trained in biology but rather for the well-educated person without special training who is interested in eugenics.

He begins by positing as his first principle that evolution always *means change but not necessarily for the better.* Hence, society needs eugenics to direct the process of human evolution. The Galtonian and Mendelian principles of inheritance are explained and applied to the transmitting of mental qualities.

Here the author gives a full and intelligent presentation of the problems of environment, the work of reformers, and how increasing populations have brought new perplexities. It is pointed out that practically all attempts at social reform are transient while eugenic reform would be permanent because it changes the hereditary factor.

Racial poisons such as drugs, alcohol, venereal diseases and their consequent effect upon racial deterioration are dealt with in a plain way. It is not meant to be exhaustive but rather to give the average reader a true picture of actual conditions.

A commonsense view of the Lamarchian theory of acquired characteristics is encouraged. It is shown that natural selection in society will not result in improvement, and that scientific methods of elimination of the unfit must be taken up. The subjects of segregation, sterilization and birth control are discussed as to their effectiveness and merits.

A long discussion of the modern social problems of feeblemindedness, insanity, epilepsy, and tuberculosis follows, with careful statistics. Facts are brought to sustain the theory that the more intelligent classes are dying out and race deterioration is setting in. As a means of preventing this trend the author emphasies the help that eugenics can give. He advocates redistribution of wealth so that the strong middle stock families may be of average size and have ample education. Birth control and sex education are encouraged.

The subject of divorce is taken up with an aim of finding the cause. More careful supervision of marriage is advocated to prevent unfit from marrying. In short the whole book is an emphasis upon public education and bringing the facts of hygienic living before society.

As a conclusion Darwin discusses the purposes of life and the riddle of the universe. He concludes with a belief in scientific determinism and that while the universe may be teleological yet man must mold his own destiny. Here is where religion and science must meet.

The book is a well-written but somewhat wordy presentation of the needs of society, prepared in a way that is suited to the intelligence of the average mind.

STANLEY F. ROUSH,
Ohio University.

NEW BOOKS AND PAMPHLETS RECEIVED*

Books and pamphlets for review should be sent to James P. Porter, Department of Psychology, Ohio University, Athens, Ohio.

An Approach to Social Medicine. Francis Lee Dunham. The Williams and Wilkins Company, Baltimore, Md., 1925. Price $4.00. 242 pp.

The Borderland: Some of the Problems of Insanity. Theo. B. Hyslop. George H. Doran Company, New York. Price $3.00. 300 pp.

The Child and Religion. Henry Jones, C. F. G. Masterman, George T. Ladd, and others. G. P. Putnam's Sons, New York, 1905. 371 pp.

Employee Representation. Ernest Richmond Burton. The Williams & Wilkins Company, Baltimore, Md., 1926. Price $3.00. 283 pp.

The Great Abnormals. Theo. B. Hyslop. George H. Doran Company, New York. Price $3.50. 289 pp.

G. Stanley Hall: A Biography of a Mind. Lorine Pruette. D. Appleton & Company, New York, 1926. Price $2.50. 267 pp.

The Hereditary Factor in the Etiology of Tuberculosis. Albert Govaerts. Eugenics Record Office, Bulletin No. 23. Cold Spring Harbor, Long Island, N. Y. 20 pp.

The History of Utopian Thought. Joyce Oramel Hertzler. The Macmillan Company, New York City, 1926.

The Inheritance of Mental Diseases. Abraham Myerson. The Williams & Wilkins Company, Baltimore. Price $5.00. 336 pp.

Introduction to Retail Advertising. Arthur Judson Brewster. A. W. Shaw Company, New York, 1926. 319 pp.

Life of Christ. Rufus M. Jones. American Library Association, Chicago, 1926. Price 50 cents. 28 pp.

Labor Relations in Industry. Dwight Lowell Hoopingarner. A. W. Shaw Company, Chicago, Ill. Price $4.00. 553 pp.

Methods of Handling Test Scores. Luella Cole Pressey and Sidney L. Pressey. World Book Company, 1926. 60 pp.

Mongrel Virginians. Arthur H. Estabrook and Ivan E. McDougle. The Williams & Wilkins Company, Baltimore, Md., 1926. Price $3.00. 205 pp.

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*Mention here does not preclude further comment.

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ANALYSIS OF THE IOWA PLACEMENT TESTS[1]

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This paper presents a detailed statistical analysis of the results secured from giving the Iowa Engineering Placement Tests[2] and the Minnesota Intelligence Tests to freshmen entering the College of Engineering and Architecture, University of Minnesota, in September, 1924. This analysis aims, by the use of partial correlation technique, to reveal the factors common to all the tests, those factors definitely related to specific tests, and the extent to which the concept of "aptitude test" and "training test" is justified.[3]

STATEMENT OF PROBLEM

The specific questions to be answered in determining the relationship of these tests to one another, are:

1. What degree of correlation, zero order, exists between each placement test and every other placement test?
2. What degree of correlation remains between these tests when intelligence test scores are partialled out?
3. What correlation is there between each placement test and intelligence test scores?
4. What degree of correlation remains between each training

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[1] The writer is deeply indebted to Prof. Donald G. Paterson for painstaking guidance and advice throughout this study.

[2] Iowa Placement Tests, composed of an "aptitude" and a "training" test in English, Mathematics, and Chemistry. Hereafter, in this paper, placement tests refer to all of the examinations and training or aptitude tests refer to the specific type of examination.

[3] Access to the data of these tests was obtained through the kindness of Dean O. M. Leland of the College of Engineering, University of Minnesota.

test and intelligence when the corresponding aptitude test is constant, and between each aptitude test and intelligence when the mated training test scores are partialled out?

Answers to these questions will reveal the nature of the several tests and at the same time will indicate the extent to which we may properly label one type of test "training" and the other type "aptitude."

METHOD OF PROCEDURE

The tests used in this study are the 1924 series published by the State University of Iowa, entitled "Iowa Placement Examinations," constructed under the direction of Seashore, Ruch, and Stoddard.

In an article entitled, "College Placement Examinations,"[4] Seashore stated, in part, that "the natural sequel to intelligence tests at college entrance is the placement examination. This examination will differ from an intelligence test primarily in the following respects:

"1. It will be devoted to a single subject or field of knowledge such as English, Mathematics, or Chemistry.

"2. It will differentiate between training in a subject and natural aptitude or fitness for that field of work."

The following descriptive material will serve to indicate the nature of the attempted distinction. The "training tests" are content examinations designed to measure present attainment in the several subjects. The "aptitude tests" are designed to measure ability to solve problems in particular fields.

For example, the English training test contains tests of spelling, punctuation, sentence structure, grammar, clearness, emphasis, and force, whereas the English aptitude test is composed of problems designed to measure a person's ability to comprehend and apply rules, ability to secure correct ideas from English text-book material, reading comprehension, and literary appreciation. The Mathematics training test is an examination in the fundamentals of arithmetic, algebra, and geometry, while the Mathematics aptitude test contains arithmetic and algebraic number series, tests of constructive imagination, pure and mathematical logic, and tests of mathematical reading comprehension. The Chemistry training test samples knowledge of fundamental chemical processes, such as valence, formulae, and equations, and knowledge of fundamental manufacturing processes. Its mated aptitude test includes the simple arithmetic of chemistry, chemistry reading comprehension, and general chemical information.

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[4] C. E. Seashore. College Placement Examinations. School and Society, vol. xx, no. 515, Nov. 8, 1924.

At the beginning of the fall quarter of 1924, these six tests were given to all freshmen registered in the English, Mathematics, and Chemistry classes in the College of Engineering and Architecture. They were administered by faculty members of the college under uniform conditions. All entering freshmen had previously taken the University of Minnesota battery of Intelligence Tests, administered by Professor Donald G. Paterson. All scoring was done by hired clerical assistants and was entirely objective. Scoring was checked where necessary and errors almost entirely eliminated. Test scores made by women, negroes, and foreign born freshmen were excluded from this data and complete records in the placement and intelligence tests were obtained for two hundred and forty-one freshmen, which group forms the basis of this study. This group is a homogeneous body of freshmen, coming for the most part from Minnesota High Schools, all between sixteen and twenty-four years of age, mainly about eighteen or nineteen, and generally typical of freshmen classes in the College of Engineering and Architecture.

RESULTS AND DISCUSSION

The following results and the conclusions drawn therefrom are based on the following assumptions:

1. High coefficients of correlation between scores of any two tests indicate similarity of measurable factors, while low coefficients argue dissimilarity of content, provided all tests have high reliability or consistency coefficients.
2. "Intelligence" is considered to be measured by the Minne-

sota battery of Intelligence Tests. These tests, five in number, include a completion test, a hard opposites test, an arithmetical and a linguistic reasoning test, and a difficult collegiate vocabulary test. For the purposes of this paper they are treated as a unit, having been weighted to make the best possible prediction of total scholarship for the first quarter.[5]

3. High coefficients of correlation between any placement test and the intelligence test indicates that the placement test measures general intelligence, while low correlations indicate that the placement test measures a unique factor, different from general intelligence, provided, again, that the reliability of the test is high.

TABLE 1

*Means and sigmas of test scores**

$n = 241$

TEST	INTELL.	EA	ET	MA	MT	CA	CT
Mean..................	10.60	40.42	95.90	32.28	53.61	77.40	69.70
Sigma..................	±2.00	±5.64	±14.15	±7.30	±9.57	±6.74	±18.65
Coeff. of Var..........	0.19	0.14	0.15	0.23	0.18	0.09	0.27

* Test names are abbreviated for convenience as follows:

EA—English aptitude test.
ET—English training test.
MA—Mathematics aptitude test.
MT—Mathematics training test.
CA—Chemistry aptitude test.
CT—Chemistry training test.
Intell.—University of Minnesota Intelligence Test.

The validity of the conclusions based on the results given below depend in large part on the soundness of the foregoing assumptions.

Table 1 presents the means, standard deviations, and coefficients of relative variability of the seven tests. These indices, except the intelligence test score, are the raw scores, i.e., total number of questions answered correctly in each case. The intelligence test index is a composite, as explained above.

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[5] H. A. Toops, Multiple Correlation Ratio Method, unpublished.

An inspection of the variability of these different tests reveals that there are important differences among them. Chemistry training has about three times the variability of Chemistry aptitude.

The great variability of the Chemistry training test may be accounted for in part by a tendency to bimodality, a small mode appearing at the lower end of the scale. This is a minor cause, however, as the actual range is large, extending roughly from 10 to 105, whereas the Chemistry aptitude test ranges from 35 to 90. Consequently, chance errors will affect correlations with the aptitude test more than with the training test. There are no significant differences among the other tests, measures of variability being much the same, but the Mathematics tests have a slightly greater variability than the English tests. Judging from variability alone, as related to the central tendency in each case, it is safe to say that the Chemistry training test is the best for diagnostic purposes, chance errors being of less significance in this test than in any other. These variabilities should be considered in studying the following coefficients of correlation, as they are largely interdependent.

Table 2 presents the *intercorrelation coefficients, zero order*, of the six placement tests. It is interesting to note that aptitude and training tests in any single subject have fairly high correlation coefficients. English aptitude correlates +0.51 with English training; Mathematics aptitude and Mathematics training correlate +0.70; and the two Chemistry tests yield a coefficient of +0.52. The aptitude tests also have fairly high intercorrelations; English and Mathematics yield +0.52; English and Chemistry +0.48; and Mathematics and Chemistry +0.53. The training tests, given in the same order correlate +0.43, +0.25, and +0.47. At the bottom of the table are the averages of the coefficients of correlation of each test with the other tests, thus, the aptitude tests have average correlations of +0.44, +0.52, and +0.51, for English, Mathematics, and Chemistry, respectively. The training tests, given in the same order, correlate +0.41, +0.53, and +0.38. To make clear what these coefficients indicate, intelligence

TABLE 2

Intercorrelation coefficients of the placement tests

$n = 241$

	EA	ET	MA	MT	CA	CT
EA		+0.51 ±0.032	+0.52 ±0.032	+0.44 ±0.035	+0.48 ±0.034	+0.25 ±0.041
ET	+0.51 ±0.032		+0.47 ±0.034	+0.43 ±0.036	+0.38 ±0.037	+0.25 ±0.041
MA	+0.52 ±0.032	+0.47 ±0.034		+0.70 ±0.022	+0.53 ±0.031	+0.39 ±0.037
MT	+0.44 ±0.035	+0.43 ±0.036	+0.70 ±0.022		+0.62 ±0.027	+0.47 ±0.034
CA	+0.48 ±0.034	+0.38 ±0.037	+0.53 ±0.031	+0.62 ±0.027		+0.52 ±0.032
CT	+0.25 ±0.041	+0.25 ±0.041	+0.39 ±0.037	+0.47 ±0.034	+0.52 ±0.032	
Average	0.44	0.41	0.52	0.53	0.51	0.38

TABLE 3

Intercorrelation coefficients of the placement tests with intelligence test scores partialled out

	EA	ET	MA	MT	CA	CT
EA		+0.25 ±0.041	+0.24 ±0.041	+0.17 ±0.042	+0.21 ±0.042	+0.009 ±0.043
ET	+0.25 ±0.041		+0.16 ±0.042	+0.15 ±0.042	+0.05 ±0.043	+0.003 ±0.043
MA	+0.24 ±0.041	+0.16 ±0.042		+0.54 ±0.031	+0.25 ±0.041	+0.18 ±0.042
MT	+0.17 ±0.042	+0.15 ±0.042	+0.54 ±0.031		+0.43 ±0.036	+0.31 ±0.039
CA	+0.21 ±0.042	+0.05 ±0.043	+0.25 ±0.041	±0.43 ±0.036		+0.37 ±0.038
CT	+0.009 ±0.043	+0.003 ±0.043	+0.18 ±0.042	+0.31 ±0.039	+0.37 ±0.038	
Average	0.18	0.12	0.27	0.32	0.26	0.18

test scores have been partialled out of each index, leaving the coefficient of correlation between the placement tests, with intelligence held constant. These coefficients are presented in table 3.

When intelligence is partialled out each coefficient drops decidedly, but the loss is not uniform in each case. The correlations between two tests in a single subject hold up fairly well, being +0.25 for English, +0.54 for Mathematics, and +0.37 for Chemistry. These are drops of 26, 16, and 15 points respectively. In other words, the English tests lose considerable in correlation when intelligence is held constant, which means that each test in English measures general intelligence as well as particular "aptitude" or "training" for English. This is demonstrated later, and is not surprising because of the linguistic nature of the Intelligence tests themselves. The Mathematics and Chemistry tests, while they lose some when intelligence is partialled out, yet retain considerable in common that is not general intelligence. This also is further demonstrated later. Intercorrelations of training and of aptitude tests show decided differences. When intelligence is held constant the aptitude tests yield intercorrelations of +0.24, +0.21, and + 0.25 for English-Mathematics, English-Chemistry, and Mathematics-Chemistry, respectively. These represent decreases of 28, 27, and 28 degrees in the order given above. The training tests drop to +0.15 for English and Mathematics, 0.00 for English and Chemistry, and +0.31 for Mathematics and Chemistry. These represent losses of 28, 25, and 16 units respectively. It is evident from these figures that English training and Chemistry training find all their correlation in the common factor of general intelligence. Otherwise, they are entirely different from each other. While the actual losses in correlation between the aptitude and the training tests in English and Mathematics and in English and Chemistry are almost identical in terms of the coefficient of correlation, yet the aptitude tests actually lose more. They drop respectively from +0.52 and +0.48 to +0.24 and +0.21, while the training tests drop from +0.43 and +0.25 to +0.15 and 0.00, respectively. The difference between +0.52 and +0.24 is greater than the difference between +0.43 and +0.15. In terms of the alienation coefficient[6] these differences are 12 per cent and 9 per cent of the respective standard deviations when used for purposes of prediction. Such a difference is not important except to indicate that equal losses in the correlation index mean different things according to their position on the scale. In these terms, the difference between the English and Chemistry tests of aptitude and training are more noticeable. The aptitude tests in English and Chemistry drop from a coefficient of +0.48 to +0.21, a difference of 10 per cent, in terms of the coefficient of alienation. The mated training tests drop from +0.25 to 0.00, a difference in terms of the coefficient of alienation of only 3 per cent. Apparently when intelligence is partialled out the aptitude tests lose more in correlation value with each other than do the training tests. This means that the training tests measure unique factors to a greater extent than do the aptitude tests. The average of the intercorrelation of each test with the others presents nothing particularly significant. They are all markedly lower when intelligence is held constant, but no decided differences are revealed. The degree of correlation between the Mathematics and Chemistry tests is interesting. Zero order correlations (table 2) are +0.62 and +0.47 for Mathematics training with Chemistry aptitude and Chemistry training, respectively, while Mathematics aptitude correlates +0.53 and +0.39 with the aptitude and training tests in Chemistry, respectively. These correlations drop to +0.43 and +0.31 for Mathematics training, and +0.25 and +0.18 for Mathematics aptitude when intelligence is constant. The high degree of correlation between these tests is no doubt due to the similarity of structure of the Mathematics training and Chemistry aptitude and training tests. The aptitude tests correlate highly because they measure general intelligence and have similar structural content. Finally, it appears from tables 2 and 3 that there are three factors in these several tests: intelligence, particularly in the aptitude tests and the

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[6] $\sqrt{1 - r^2}$.

English training test; particular aptitudes, especially mathematical *as distinct from general intelligence;* and mathematical and chemical training. These conclusions are further emphasized by table 4.

Table 4 presents the zero order coefficients of correlation of each placement test with the intelligence test scores. It also presents coefficients of correlation of each placement test with intelligence, partialling out the mated placement test. Thus English aptitude and intelligence correlate +0.58 and drop to +0.40 when English training scores are constant. This indicates that a high degree of correlation remains between this aptitude test and intelligence when training is ruled out. Again, English training and intelligence correlate +0.59, dropping to +0.37 when the aptitude test is constant. A similar conclusion follows; English training and intelligence retain a fair degree of correlation when aptitude is partialled out. A slight suggestion is present that English aptitude and intelligence are more closely related than are intelligence and English training, since partialling training lowers the correlation from +0.58 to +0.40, only 18 points, while with aptitude constant the coefficient falls from +0.59 to +0.37, or 22 degrees.

TABLE 4

Correlation of Placement Test scores with Minnesota Intelligence Test scores zero order, and with the mated Placement Test scores partialled out.

$n = 241$

TEST	r WITH INTELL.		TEST	r WITH INTELL.	
	Zero order	Training test constant, first order partial		Zero order	Aptitude test constant, first order partial
EA	+0.58±0.029	+0.40±0.037	ET	+0.59±0.029	+0.37±0.038
MA	+0.63±0.026	+0.40±0.037	MT	+0.56±0.030	+0.21±0.042
CA	+0.50±0.028	+0.48±0.034	CT	+0.42±0.036	+0.16±0.042
Average.	+0.60	+0.43	Average.	+0.52	+0.25

From tables 2 and 3 we see that the two English tests correlate +0.51, zero order, and +0.25 with intelligence constant, a drop of 26 points. Seemingly, then, intelligence is the most important factor present in the three tests, but English aptitude and English training are present as particular factors, the latter slightly more so than the former.

The Mathematics and Chemistry tests show somewhat different results. The aptitude test in mathematics correlates +0.63 with intelligence and falls 23 degrees to +0.40 when its mated training test is held constant. This indicates that intelligence and aptitude for mathematics are correlated to a fair degree, and it also means that training in mathematics is also related to both intelligence and aptitude for mathematics. The training test correlates +0.56 with intelligence and it drops 35 points when aptitude is held constant. Evidently most of the relationship between mathematics training and intelligence is due to the mutual relationship of each of these tests to mathematics aptitude. Tables 2 and 3 sustain this conclusion, since the two mathematics tests correlate +0.70, zero order, dropping only 16 points to +0.54 with intelligence constant. Here then we have a common factor of general intelligence, and a unique factor of training in mathematics. In other words, a mathematics training test plus an intelligence test would measure practically all that is measured by a training test and an aptitude test in mathematics. The same conclusions are equally true of the Chemistry tests as related to intelligence.

The average of the coefficients of correlation for aptitude tests with intelligence is +0.60, zero order, and +0.43 when training tests are constant. The training tests have an average coefficient of correlation with intelligence of +0.52, zero order, and +0.25 when the aptitude tests are partialled. It follows that the aptitude tests and intelligence tests are closely related, while the training tests and intelligence tests measure different factors.

THE QUESTION OF RELIABILITY

The group of freshmen on whom this study is based was a homogeneous group. Distribution of scores in each test approached normality, except for the test in Chemistry training, which was very slightly bimodal, having a small mode at the lower end of the scale. This mode was almost insignificant, however, and its effect probably negligible. The size of this group is fairly satisfactory and is probably typical, since it encompassed practically the entire entering freshman class in the College of Engineering and Architecture.

A limitation on this study enters in because of the time of giving the placement tests. They were not given at the first meeting of the several classes but two weeks after the first meeting, in which time considerable reviewing of the fields of the tests was possible. The effect of that delay is not measurable until the tests are given again on the first meeting of the several classes. However, the effect of such review is probably not serious, each student having the same advantage as every other. It may have accentuated existing differences, but for purposes of this particular study that would not be serious.

The Minnesota Intelligence Tests have reliabilities around +0.90[7] and combined as they were for this paper, their reliability is satisfactory. The actual reliability of the placement tests is not known, and the type of question used very largely—true-false, right-wrong, etc.—leads one to hesitate to give these tests an index of reliability. It has been demonstrated that the true-false type of question is not very reliable unless about two hundred items are included,[8] but a reliability of +0.75 or +0.80 is a conservative estimate for the total test score, since other more reliable types of questions are also included. More reliable results would be obtained with more reliable tests, but the differences between the two kinds of test, aptitude and training, are great enough to be safely demonstrated for this group.

The tests used are the first edition and are tentative only.

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[7] Self Correlation.

[8] G. M. Ruch. The Improvement of the Written Examination. Published by Scott, Foresman Co., N. Y., 1924. pp. 114–120.

Donald G. Paterson and T. A. Langlie. Empirical data on the scoring of true-false tests. Journal of Applied Psychology, vol. ix, no. 4, Dec., 1925.

Experimenting will no doubt lead to improvements in reliability and validity. This study, accordingly, is limited in application because of the uncertainty of both reliability and validity, but the results as given are noteworthy as applied to these particular tests, and very probably to other tests which attempt to distinguish particular aptitudes and abilities.

GENERAL SUMMARY AND CONCLUSION

1. The tests under consideration do differentiate fairly well, except the Chemistry aptitude test with its coefficient of variability of 0.09.
2. Each test is dependent to a fair degree upon general intelligence, particularly the aptitude tests.
3. A particular aptitude is dependent upon training in that particular line.
4. Mathematics training and Chemistry training as measured by these tests have considerable in common, presumably training in Mathematics.
5. The training tests in Mathematics and Chemistry are different from intelligence and aptitude tests.
6. Finally, we may conclude that the factors measured by these tests are:

a. General intelligence, as measured by tests in current use;

b. Training in particular subjects, especially Mathematics and Chemistry; and

c. Mathematical aptitude (which may be termed intelligence plus training in Mathematics).

The third factor is enumerated because it shows up in the Chemistry tests as well as in the Mathematics tests, due to their construction. These tests differ markedly from the English tests, particularly from the English training test.

There seems to be no real differentiation between "aptitude" and "training" in any of these particular subjects, aptitude being general intelligence plus training. It appears that a good intelligence test plus the three training tests will measure every factor that the six placement tests together measure, namely, general intelligence and particular achievements.

A MEASUREMENT OF SOCIABILITY

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The tests described here have been devised to measure the social intelligence or sociability of an individual. The sociable individual may be defined as the individual who has the ability to get on agreeably with his fellow men, who is inclined or adapted for society, who is friendly and above all easy to talk to. He is companionable and fond of mingling with others; he seems to enjoy people and likes to be with them and to talk to them much of the time. In short, he is the type of individual we call a "good mixer." It is not necessarily to be inferred from these brief comments that sociability is a unit trait; it may be, or it may be a combination of several traits. Whether it is a single trait or a combination of several traits makes no more difference for this test than the similar problem which arises in the measurement of intelligence.

There are four parts to this test; three are made with photographs and the fourth is a questionnaire. The first photographs test, which in the future will be referred to as the "recognition test," was made with fifty photographs. The following directions were given to the observers: "Twenty photographs are to be successively shown to you on the screen and you are to look at them the first time they are run through; do not write anything; look at them this time with the intention of recognizing as many as possible of the twenty when they are presented to you a second time. At the second presentation these twenty will be mixed with thirty additional photographs which you have not seen before. When you recognize a photograph, record the number of that one under the legend "recognized" on your paper, write the numbers of those you do not recognize under the legend "not recognized." You will have the numbers beginning with one and ending with fifty recorded when the experiment is completed."

In scoring the papers of the "recognition test," each correctly recognized photograph received the mark of 5 per cent, thus if the entire twenty pictures were recognized the observer received a grade of 100 per cent. However, if such photographs as had not been included in the first twenty presented, were recorded under the word "recognized," the score of 5 per cent was deducted for each one. This was deemed advisable because some of the observers recorded more than twenty numbers in the "recognized" column, presumably in the hopes that among the numbers included, the twenty correct ones would be found, thereby insuring a grade of 100 per cent. It may be said though, for the most part very few did include more than twenty numbers in the "recognized" column; this would tend to indicate that very little guess work went on in the experiment.

The photographs included in these tests were selected from a college annual. They were selected upon the basis of uniformity of shades and sizes of the photographs. No photographs of persons who were in any way unusual in appearance were included in these experiments. All the photographs were presented to the observers as a group by means of a projection lantern; approximately five seconds were allowed for each exposure. The "recognition" test is based on the assumption that the more sociable observers will recognize a larger number of photographs than will the less sociable.

The second photographs test is made up of ten "similar" photographs and will be referred to as the "similars test." It is so called because the ten pictures used are "similar," that is, they are of the same kind as described in the "recognition test," all of them being of men between the ages of twenty and thirty. The following directions were given to the observers: "Ten people are to be introduced to you by their photographs on the screen. The name, the occupation of the individual, and the city in which he lives will be given orally at the same time the photograph appears. The introduction in every case will be made twice. For example (as trial picture appears on the screen), "Mr. Gilmore, athletic director from Cleveland; Mr. Gilmore, athletic director from Cleveland." Ten pictures will be run through in this manner. The first time they are presented, you are to look at them and remember in so far as possible who each one is, where he is from and what his occupation is; do not write anything. At the conclusion of this part of the experiment, these ten photographs will be re-presented in a different order. When each picture appears, you are to write down the name, occupation and city of those individuals whom you are able to recall."

The purpose in using this experiment is again based on the assumption that the more sociably inclined observers will be able to recall the greater number of people presented, their occupations and home cities.

The third photographs test, the "dissimilars test," is thus termed because there are ten photographs of the same kind as described in the "recognition test," but they are dissimilar in that they are of both men and women ranging from twenty to eighty years of age. Of course not all varieties and classes of people were included since these photographs were also selected from a college annual. Ten different occupations are represented in the titles for this group, however, ranging all the way from farmer to librarian and doctor to detective.

The method of scoring both the "similars" and the "dissimilars" photographs tests is as follows: 10 per cent is given for each photograph making a total of 100 per cent for the ten photographs if all the answers are correct. In each case if the name only is given correctly a score of 4 per cent on the question is recorded. A score of 4 per cent is also given for each correct occupation, and a score of 2 per cent for each correctly named city.

The fourth measurement of sociability was a questionnaire composed of certain questions which, in the opinion of the writer, seemed to be indicative of sociability as evidenced in the college student. In so far as possible, each question was of a quantitative rather than a qualitative nature. In order to

TABLE FOR SCORING THE QUESTIONNAIRE

QUESTION	SCORES																
	0	1	1½	2	2½	3	4	5	6	7	7½	8	9	10	12	12½	15
1. How many intimate friends have you, etc.	0	1		2		3–5	6–10	11–more									
2. How many ordinary friends have you, etc.				0–49			50–199		200–599			600–1000		1001–more			
3. How many speaking acquaintances have you				0–199			200–499		500–599			1000–1499		1500–more			
4. How many dances do you attend during college year	0			1–6			7–15		16–30			31–65		66–more			
5. How many social gatherings, etc.						1–24			25–74				75–149		150–249		250–more
6. During your leisure do you enjoy being with other people	e*				d*			c*			b*			a*			
7. Do you like public speaking	e*				d*			c*			b*			a*			
8. Do you enjoy participating in dramatics	e*				d*			c*			b*			a*			
9. How many personal letters other than from your family do you receive a week		1		2		3–4	5–8	9–more									

10. How many times a semester do you go to the theater...........................	0	1	2–5	6–10	11–20	21–more							
11. How many times a month do you go to the movies...........................	0	1	2–3	4–7	8–14	15–more							
12. Do you enjoy meeting new people.......	e*	d*	c*		b*	a*							

*a, = most, very much, etc.; b = large part, quite well, etc.; c = some, fairly well, etc.; d = very little, not very well; e = not at all.

Note: This method of scoring was determined upon by an analysis of the reports of thirty students.

determine a satisfactory method of scoring, the questionnaire was tested out on a class of thirty students and a tentative rating scale constructed from the results thus obtained. In the questions in which numerical answers were involved, no suggestions were given the subjects as to the most common replies. The questionnaire in its original form consisted of seventeen questions but in the scorings twelve questions only were considered, the value of each again being determined by the opinion of the writer. No time limit was set but the observers were asked to work as accurately and quickly as possible.

The questionnaire and the method of scoring is as follows:

THE QUESTIONNAIRE

Name...

Please answer as accurately as you possibly can the following questions. If you have any comments to make on any of them, do so at the right of the question.

1. How many intimate friends have you? By intimate is meant friends who confide in you. Answer
2. How many ordinary friends have you? By this term is meant friends, whom if you met on the street, you would stop and speak with a moment. Take into consideration friends outside of college mates as well as college mates too.
   Answer
3. How many speaking acquaintances have you? This group is to be taken entirely separately from groups 1 and 2.
   Answer
4. How many dances do you attend *during the school year?*
   Answer
5. How many social gatherings do you attend *during the school year?* This includes all social affairs which are not dances.
   Answer
6. Check below the answer with which you most nearly agree. During your leisure do you enjoy being with other people
   a. Most of the time
   b. A large part of the time
   c. Some of the time
   d. Very little of the time
   e. Not at all
7. Check below the answer with which you most nearly agree. Public speaking (if you have never done any, check the

way you think that you would feel). Do you like public speaking

a. Very much
b. Quite well
c. Fairly well
d. Not very well
e. Not at all

8. Check below the answer with which you most nearly agree. Dramatics and the like. Do you enjoy *participating* in such

a. Very much
b. Quite well
c. Fairly well
d. Not very well
e. Not at all

9. How many personal letters do you receive a week *other than from your family?* Answer

10. How many times a *semester* do you go to the *theater?* Answer

11. How many times a *month* do you go to the *movies?* Answer

12. Check below the answer with which you most nearly agree. Do you enjoy meeting new people

a. Very much indeed
b. Quite well
c. Somewhat (fairly well)
d. Not very well
e. Not at all

Three classes in psychology at Northwestern University were used as subjects for this experiment. They will be referred to hereafter as Group I, Group II, and Group III. Group I consisted of twenty-seven members of a class in Advanced General Psychology. Group II consisted of forty members of a class in Abnormal Psychology. Group III was composed of twenty-four members of a class in Fields of Psychology.

Ratings in sociability (sociability having been described to the subjects in the same terms as it is defined in the introductory paragraph of this article) were used as a check on the validity of the four sociability tests already mentioned. It is realized that ratings are not as reliable as they might be but unfortunately they are the best single check that has been devised up to the present time. The average of the total ratings was used for one check. A second check was made by using the average of the ratings assigned by those individuals who were rated highest themselves in sociability, it being claimed by Hollingworth[1] that an individual who possesses a given trait to a high degree is better able to judge that trait in another individual. The observers for the most part were fairly well acquainted, having been in college together for several years. They did not rate anyone whom they did not know.

Form eight of the Army Alpha Intelligence Test was given to each of the observers as well as a rote memory test consisting of thirty common words. The purpose of these tests was to discover whether we were measuring intelligence of the same kind of Army Alpha measures, or if the photographs tests were merely tests in rote memory.

From the data at hand we have come to the following conclusions:

1. The "similar" photographs test does not seem to be a satisfactory measure of social intelligence. In every case the correlation is below 0.27.

2. The "dissimilar photograph test" is a somewhat better test for sociability than the "similars" test, but more data will have to be compiled in order to determine the validity of this specific test. The highest correlations found here were 0.43, 0.37, and 0.34.

3. The "recognition test" is better than either the "similars" or the "dissimilars" photographs tests. For the most part the correlations were 0.25 or higher, two being 0.43 and 0.47.

4. The three photographs tests combined correlate fairly high throughout with the total average ratings. Practically all the correlations were 0.25 or above, the two highest being 0.46 and 0.48.

5. That the four sociability tests as well as the ratings in sociability do not measure the same thing that the Army Alpha measures is shown by the following correlations; 0.10, 0.03, 0.01, and 0.002.

6. The rote memory test was used in Group III only. From

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[1] Hollingworth, H. L. Judging Human Character. Chapter IV.

TABLE 1

Correlations obtained from the data of Groups I, II and III between the various sociability tests, intelligence tests and ratings in sociability

In each instance the P.E. is indicated below its corresponding correlation.

	"SIMILARS" TEST			"DISSIMILARS" TEST			"RECOGNITION" TEST			QUESTIONNAIRE			ARMY ALPHA TEST	
For Groups..............	I	II	III	I	II	III	I	II	III	I	II	III	I	II
"Dissimilars" test..	0.41 (0.10)	0.26 (0.09)	0.13 (0.12)											
"Recognition" test.	0.35 (0.10)	0.20 (0.09)	0.05 (0.13)	0.19 (0.12)	0.22 (0.09)	0.11 (0.13)								
Questionnaire.......	0.40 (0.10)	0.15 (0.10)	−0.12 (0.13)	0.36 (0.10)	0.24 (0.09)	−0.16 (0.12)	0.36 (0.10)	0.42 (0.08)	0.21 (0.12)					
Army Alpha Intelligence test.......	0.17 (0.12	0.17 (0.10)		0.30 (0.11)	0.04 (0.10)		−0.26 (0.12	−0.21 (0.09)						
Rote memory test..			0.57 (0.08)			0.05 (0.13)			0.02 (0.13)					
Average ratings of class.............	0.15 (0.12)	0.15 (0.10)	−0.15 (0.12)	0.56 (0.08)	0.30 (0.09)	−0.02 (0.13)	0.37 (0.10)	0.07 (0.10)	0.47 (0.10)	0.60 (0.08)	0.50 (0.07)	0.43 (0.10)	0.002 (0.12)	−0.18 (0.10)
Average of ratings of those rated highest...............	0.10 (0.12)	0.18 (0.09)	−0.32 (0.11)	0.45 (0.09)	0.16 (0.10)	−0.07 (0.13)	0.19 (0.12)	0.19 (0.09)	0.34 (0.11)	0.21 (0.11)	0.48 (0.07)	0.34 (0.11)	−0.07 (0.12)	−0.04 (0.10)

TABLE 2

Correlations obtained from the data of Groups I, II and III between a combination of the various sociability tests and the ratings in sociability, etc.

In each instance the P.E. is indicated below its corresponding correlation.

	QUESTIONNAIRE AND "RECOGNITION" TEST COMBINED			THREE PHOTOGRAPHS TESTS COMBINED			THREE PHOTOGRAPHS TESTS AND QUESTIONNAIRE COMBINED		
For Groups	I	II	III	I	II	III	I	II	III
Average ratings of class	0.58 (0.08)	0.25 (0.09)	0.40 (0.11)	0.48 (0.10)	0.25 (0.09)	0.25 (0.12)	0.57 (0.08)	0.34 (0.09)	0.39 (0.11)
Average of ratings of those rated highest	0.25 (0.11)	0.34 (0.09)	0.32 (0.11)	0.11 (0.12)	0.25 (0.09)	0.08 (0.13)	0.35 (0.10)	0.34 (0.09)	0.19 (0.12)
Questionnaire				0.50 (0.14)	0.41 (0.08)				
Army Alpha				0.10 (0.12)	−0.03 (0.10)				

these limited data we find a correlation of 0.57 between the rote memory and the "similars" test which tends to indicate that after all the "similars photographs test" may be closely related to rote memory. This is not true of the "recognition" test and the "dissimilars" test which correlate 0.02 and 0.05 respectively.

7. The questionnaire is by far the best single method we have devised for measuring sociability. The correlations are uniformly high (in the 0.50 and 0.60 for the most part with the exception of one or two cases). This particular questionnaire is relatively reliable then, in determining sociability as evidenced in the college student; but it has the disadvantage that it cannot be used with groups other than college groups for the questions pertain to college activities.

8. The questionnaire and the "recognition" test combined show fairly high correlation throughout with the ratings in sociability, indicating that a combination of these two tests may prove a reliable measure of that trait.

9. The correlations for Group I are consistently higher and are probably more reliable than for Groups II and III. The students in this group had been in college together longer, were better acquainted with one another and had received more special instruction in methods of rating than the other two groups.

On the basis of the data so far presented we conclude that the present questionnaire is a very reliable measure of sociability in university students. In fact it seems to be a better measure of this trait than the average group test is a measure of intelligence. The "recognition test" is also fairly reliable, and the "dissimilars test" may become more reliable with certain modifications. The three photographs tests combined, and the three photographs and the questionnaire combined likewise make a very reliable measure of social intelligence.

The following changes have been suggested for future study on the problem. First that the questionnaire be revised in order that it may apply to more general groups of individuals rather than to college students only. Second, that the "dissimilars test" and the "recognition test" be revised and modified to some extent before they can be accepted as definite measures. It may be that more "dissimilarity," so to speak, will make the test more satisfactory than it is at present. With such changes and possibly some others yet to be devised this gives evidence of becoming a very satisfactory test of the kind of intelligence which Thorndike has designated as social intelligence or which we have called sociability.

OPTIMUM DIFFICULTY OF GROUP TEST ITEMS

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THE PROBLEM

General practice in the construction of group tests for the purpose of measuring capacity and attainment seems to favor an inclusion of test items ranging from very easy to very difficult. Certain statistical reasons for this practice may be offered. Published studies on test construction offer little or no empirical data on the subject.

Where tests are used for measurement within groups of people with similar abilities, the range of difficulty of test items tends to be constant. A question arises as to whether this range of difficulty of test items should be wide or narrow. Is there, for instance, an optimum difficulty for test items when used year after year for predictive purposes in closely homogeneous groups? Or we might state the question in another way: Is there a best range of difficulty of test items using predictive value as a criterion?

PROCEDURE

The data used in the present study were secured primarily for the purpose of determining the predictive value of test items occurring in two examinations in common use with college freshmen. The items occur in Thorndike Intelligence Examination, Part I, Forms E and N; and Iowa Content Examination, Form A. The subjects used were two groups of 240 college students chosen from among a larger group of entering freshmen at the Carnegie Institute of Technology.

The subjects were chosen to represent four levels of ability in the freshman class, i.e., upper fourth or superior; above average; below average; and lower fourth or inferior. Persons were assigned to a particular group on the basis of agreement of three indices, viz., Thorndike Examination score, Iowa Content Examination score, average of freshman scholarship marks. A person was assigned to a given group when it was found that the three indices agreed with each other as to the probable level of ability. Representative groups of 60 each were thus selected for the four levels of ability designated.

A frequency count of right and wrong responses was made for each test item answered by persons in each group of 60. From these frequencies it was possible to determine the relative difficulty of each test item and also to determine the predictive value of each test item.

The criterion of relative difficulty was determined quantitatively by a figure representing the total number of right responses made by the entire group of 240 persons. Omissions were counted as wrong responses except in cases where all the test items were not covered by the individual in the time allotted. In such instances the ratio of right versus wrong responses was determined for the number attempted. This ratio was used to estimate the probable number which would have been right had all the persons reached that point in the examination.

The criteria of predictive value of test items were determined on the basis of efficiency of given test items in distinguishing the groups representing four levels of ability. If a greater number of superior and above average persons gave right responses to a test item than did the below average and inferior, the item was considered to have predictive value.

Two methods of determining quantitative criteria of predictive value were used as a basis for the present study.

Criterion I

R_1 equals right responses—Superior group
R_2 equals right responses—Above average group
R_3 equals right responses—Below average group
R_4 equals right responses—Inferior group

R_1 minus R_2 equals X_1
R_1 minus R_3 equals X_2
R_1 minus R_4 equals X_3
R_2 minus R_3 equals X_4
R_2 minus R_4 equals X_5
R_3 minus R_4 equals X_6

Sum X's equal Differential value I

Criterion II

R_1 minus R_4 equals Y equals Differential value II

The answer to the question of best range of difficulty of test items was sought by making comparisons of the values obtained for degree of difficulty with each of the stated criteria of predictive value.

SIGNIFICANT DATA

The tables which follow contain data which have bearing upon the problem being considered.

The figures at the left of each table represent the difficulty values of test items. The columns to the right are indicated by letters which have the following significance:

Column "N" indicates the number of items in each class interval.
Column "R" indicates the range of predictive values found in each interval.
Column "M" indicates the mean predictive value for each stated interval of difficulty.
Column "D" indicates the rank of each interval on the basis of predictive values shown in column "N."

Tables 1, 2 and 3 present the basic data arranged for ten equally divided class intervals. Tables 4, 5 and 6 present the same data arranged for percentile intervals. Tables 7, 8, 9 and 10 are summaries of data found in preceding tables. Table 11 shows the range of difficulty of five intervals of tables 1 to 6 having the greatest predictive values. Tables 7 to 11 contain summaries of preceding tables.

TABLE 1

Average predictive values of test items in the Iowa Content Examination, Form A—240 subjects—400 items

INTERVAL OF DIFFICULTY	N	R	M	D
Criterion I				
217–240	27	2 to 36	21.1	8
193–216	58	4 to 93	40.7	6
169–192	66	−9 to 104	49.7	5
145–168	57	2 to 128	60.2	1
121–144	49	−26 to 110	50.5	4
97–120	38	−9 to 114	54.1	2
73–96	44	−27 to 88	50.6	3
49–72	37	−34 to 86	31.3	7
25–48	19	−22 to 53	17.7	9
0–24	5	9 to 21	13.0	10
Criterion II				
217–240	27	1 to 11	7.1	8
193–216	58	−30 to 29	9.1	6
169–192	66	−2 to 33	16.2	3
145–168	57	−1 to 40	18.7	1
121–144	49	−11 to 57	16.1	4
97–120	38	3 to 32	18.2	2
73–96	44	0 to 31	14.9	5
49–72	37	−12 to 25	8.5	7
25–48	19	−4 to 18	6.8	9
0–24	5	3 to 7	4.8	10

TABLE 2

Average predictive values of test items in Thorndike Intelligence Examination, Part I, Form E, and parts of Form N—240 subjects—236 items

INTERVAL OF DIFFICULTY	N	R	M	D
Criterion I				
217–240	68	−9 to 51	11.0	9
193–216	50	−7 to 84	27.7	6
169–192	32	−18 to 98	41.5	5
145–168	36	−28 to 125	47.7	4
121–144	17	1 to 131	61.2	2
97–120	12	−3 to 124	60.3	3
73–96	5	30 to 103	65.8	1
49–72	9	−3 to 49	21.3	7
25–48	4	−3 to 17	9.5	10
0–24	3	14 to 15	14.3	8
Criterion II				
217–240	68	−3 to 20	3.4	9
193–216	50	−3 to 26	9.1	6
169–192	32	−18 to 31	11.6	5
145–168	36	−7 to 37	13.8	4
121–144	17	5 to 37	18.5	3
97–120	12	−3 to 39	18.6	2
73–96	5	10 to 34	21.0	1
49–72	9	−1 to 13	7.1	7
25–48	4	−1 to 6	2.3	10
0–24	3	3 to 5	4.1	8

TABLE 3

Average predictive value of test items in Thorndike Intelligence Examination, 10 tests from Form E, Part I—480 subjects—109 items

INTERVAL OF DIFFICULTY	N	R	M	D
		Criterion I		
433–480	31	−3 to 67	24.6	8
385–432	24	14 to 136	73.0	5
337–384	10	−21 to 149	69.5	6
289–336	18	−34 to 187	89.5	4
241–288	8	35 to 197	94.5	2
193–240	8	2 to 207	121.6	1
145–192	2	53 to 134	93.5	3
97–144	4	31 to 99	65.7	7
44–96	4	12 to 21	10.5	9
0–48	0			
		Criterion II		
433–480	31	−1 to 30	8.4	8
385–432	24	3 to 43	21.5	6
337–384	10	−7 to 58	26.2	4
289–336	18	−12 to 59	30.6	1
241–288	8	12 to 68	26.0	5
193–240	8	−1 to 60	29.0	3
145–192	2	19 to 42	30.5	2
97–144	4	9 to 32	21.0	7
44–96	4	4 to 10	6.0	9
0–48	0			

TABLE 4

Average predictive values of test items in Iowa Content Examination, Form A—240 subjects—400 items

PERCENTILE INTERVALS	INTERVAL RANGE	R	M	D
		Criterion I		
91–100	(215–238)	2 to 61	26.9	10
81–90	(204–215)	5 to 97	40.5	8
71–80	(191–203)	4 to 113	50.2	6
61–70	(174–190)	9 to 104	52.7	4
51–60	(156–173)	2 to 128	64.2	1
41–50	(135–155)	−26 to 97	50.6	5
31–40	(111–134)	−11 to 114	54.9	2
21–30	(87–110)	−9 to 97	53.1	3
11–20	(62–86)	−27 to 88	41.8	7
0–10	(10–61)	−34 to 82	28.1	9
		Criterion II		
91–100		−11 to 18	7.2	9
81–90		−30 to 29	8.1	8
71–80		−28 to 31	12.5	7
61–70		−27 to 33	15.9	4
51–60		−22 to 40	18.8	1
41–50		−28 to 57	15.5	5
31–40		5 to 31	17.0	2
21–30		−13 to 31	16.1	3
11–20		−4 to 25	13.1	6
0–10		−12 to 18	6.5	10

TABLE 5

Average predictive values of test items in Thorndike Intelligence Examination, Part I, Form E, and parts of Form N—240 subjects—236 items

PERCENTILE INTERVALS	INTERVAL RANGE	R	M	D
Criterion I				
91-100	(232-240)	−9 to 21	3.7	10
81-90	(225-231)	−4 to 27	11.1	9
71-80	(215-224)	−7 to 51	20.7	8
61-70	(203-214)	4 to 58	24.9	7
51-60	(192-202)	10 to 88	32.8	5
41-50	(175-191)	−18 to 98	37.0	3
31-40	(157-174)	2 to 92	33.1	4
21-30	(138-156)	−4 to 125	60.8	1
11-20	(106-137)	−3 to 131	57.0	2
0-10	(17-105)	−3 to 113	32.3	6
Criterion II				
91-100		−2 to 7	1.5	10
81-90		−3 to 10	3.2	9
71-80		−3 to 20	6.3	8
61-70		1 to 18	9.0	7
51-60		−1 to 26	9.9	6
41-50		−5 to 31	13.5	3
31-40		−7 to 23	12.1	4
21-30		−1 to 37	18.3	2
11-20		−3 to 36	18.9	1
0-10		−1 to 39	10.5	5

TABLE 6

Average predictive value of test items in Thorndike Intelligence Examination 10 tests from Form E, Part I—480 subjects—109 items

PERCENTILE INTERVALS	INTERVAL RANGE	R	M	D
		Criterion I		
91–100	(463–479)	−7 to 25	7.7	10
81–90	(448–462)	0 to 46	22.7	9
71–80	(432–447)	6 to 66	37.7	8
61–70	(406–431)	14 to 131	60.4	6
51–60	(387–405)	39 to 136	84.2	3
41–50	(340–386)	−21 to 149	73.4	4
31–40	(311–339)	−34 to 160	67.6	5
21–30	(274–310)	35 to 187	104.1	2
11–20	(153–274)	2 to 207	110.2	1
0–10	(55–152)	12 to 134	52.5	7
		Criterion II		
91–100		−2 to 8	2.5	10
81–90		−1 to 30	9.4	9
71–80		6 to 22	12.8	8
61–70		3 to 43	19.8	6
51–60		−12 to 40	24.5	4
41–50		−7 to 58	26.7	3
31–40		−12 to 68	22.1	5
21–30		12 to 59	35.9	1
11–20		−1 to 58	26.9	2
0–10		4 to 32	16.5	7

TABLE 7

Average predictive values

CLASS INTERVAL	AVERAGES, TABLE 1	AVERAGES, TABLE 2	AVERAGES, TABLE 3 (DIVIDED BY 2)	SUM OF THREE AVERAGES	D
Criterion I					
217-240	21.1	11.0	12.3	44.4	8
193-216	40.7	27.7	36.5	104.9	6
169-192	49.7	41.5	34.7	125.9	5
145-168	60.2	47.7	44.7	152.6	4
121-144	50.5	61.2	47.2	158.9	3
97-120	54.1	60.3	60.8	175.2	1
73-96	50.6	65.8	46.7	163.1	2
49-72	31.3	21.3	32.9	85.5	7
25-48	17.7	9.5	8.7	35.9	10
0-24	13.0	14.3*	10.0	37.3	9
Criterion II					
217-240	7.1	3.4	4.2	14.7	8
193-216	9.1	9.1	10.7	28.9	6
169-192	16.2	11.6	13.1	40.8	5
145-168	18.7	13.8	15.3	46.8	4
121-144	16.1	18.5	13.0	47.6	3
97-120	18.2	18.6	14.5	51.3	1
73-96	14.9	21.0	15.2	51.1	2
49-72	8.5	7.1	10.5	26.1	7
25-48	6.8	2.3	3.0	11.1	10
0-24	4.8	4.1*	3.0	11.9	9

* Estimated.

TABLE 8

Average predictive values

PERCENTILE INTERVAL	AVERAGES, TABLE 4	AVERAGES, TABLE 5	AVERAGES, TABLE 6 (DIVIDED BY 2)	SUM OF THREE AVERAGES	D
Criterion I					
91–100	26.9	3.7	3.8	34.4	10
81–90	40.5	11.1	11.3	62.9	9
71–80	50.2	20.7	18.8	89.5	7
61–70	52.7	24.9	30.2	107.8	6
51–60	64.2	32.8	42.1	149.1	3
41–50	50.6	37.9	36.7	125.2	4
31–40	54.9	33.1	33.8	121.8	5
21–30	53.1	60.8	52.0	165.9	1
11–20	41.8	57.0	55.1	153.9	2
0–10	28.1	32.3	26.2	87.6	8
Criterion II					
91–100	7.2	1.5	1.2	9.9	10
81–90	8.1	3.2	4.7	16.0	9
71–80	12.5	6.3	6.4	25.2	7.5
61–70	15.9	9.0	9.9	34.8	6
51–60	18.8	9.9	12.2	40.9	4
41–50	15.5	13.5	13.3	42.3	3
31–40	17.0	12.1	11.0	40.1	5
21–30	16.1	18.3	17.9	52.3	1
11–20	12.1	18.9	13.4	45.4	2
0–10	6.5	10.5	8.2	25.2	7.5

TABLE 9

Average rank—tables 1 to 3

CLASS INTERVAL	TABLE 1		TABLE 2		TABLE 3		AVERAGE RANK
	Criterion I	Criterion II	Criterion I	Criterion II	Criterion I	Criterion II	
217–240	8	8	9	9	8	8	8.3
193–216	6	6	6	6	5	6	5.8
169–192	5	3	5	5	6	4	4.3
145–168	1	1	4	4	4	1	2.5
121–144	4	4	2	3	2	5	3.3
97–120	2	2	3	2	1	3	2.1
73–96	3	5	1	1	3	2	2.5
49–72	7	7	7	7	7	7	7.0
25–48	9	9	10	10	9	9	9.3
0–24	10	10	8	8	x	x	9.0

TABLE 10

Average rank—tables 4 to 6

PERCENTILE INTERVAL	TABLE 4		TABLE 5		TABLE 6		AVERAGE RANK
	Criterion I	Criterion II	Criterion I	Criterion II	Criterion I	Criterion II	
91–100	10	9	10	10	10	10	9.9
81–90	8	8	9	9	9	9	8.6
71–80	6	7	8	8	8	8	9.1
61–70	4	4	7	7	6	6	5.6
51–60	1	1	4	6	3	4	3.1
41–50	5	5	3	3	4	3	3.9
31–40	2	2	5	4	5	5	3.9
21–30	3	3	1	2	2	1	2.0
11–20	7	6	2	1	1	2	3.1
0–10	9	10	6	5	7	7	7.3

TABLE 11

Ranges of difficulty of five intervals having greatest predictive values as shown by tables 1 to 6—total possible range 0 to 240

		LOWER INCIDENCE MOST DIFFICULT	UPPER INCIDENCE LEAST DIFFICULT
Table 1	Criterion I	73	192
	Criterion II	73	192
Table 4	Criterion I	87	190
	Criterion II	87	190
Table 2	Criterion I	73	192
	Criterion II	73	192
Table 5	Criterion I	106	202
	Criterion II	Between 17 and 105	191
Table 3	Criterion I	73	216*
	Criterion II	73	192*
Table 6	Criterion I	87	190*
	Criterion II	87	190*

* Figures given for tables 3 and 6 were obtained by dividing the actual number by 2 in order to make them comparable with the ranges given for tables 1, 2, 4 and 5.

CONCLUSIONS

1. An optimum specific difficulty for predictive purposes is not indicated by the data presented in this report. The fluctuation of interval ranks shown in column "D" of the various tables would seem to indicate that there is none. There is, however, a best range of difficulty for predictive purposes suggested by the manner in which the data group themselves.

2. If the five intervals having the highest predictive merit are selected from tables 1, 2 and 3, it is found that they cluster around the mean. Some tend away from the mean toward the most difficult end of the scale and others tend away from the mean toward the least difficult end of the scale.

3. The ranges of predictive merit for each class interval shown

in column "R" follow closely the ranks of predictive merit shown in column "D."

4. That the conditions found are not peculiar to one test or examination is indicated by the degree of agreement shown by the summaries in tables 7 and 9.

5. In order to overcome differences in the number included in each class interval, percentile intervals were introduced in tables 4, 5, 6, 8 and 10. The seeming discrepancies in tables 4, 5 and 6, column "D," as compared with tables 1, 2 and 3 disappear upon examination of the lower and upper incidences of the best range of difficulty. This is shown in table 11.

6. Within the limits of the data presented, it appears that the test items having greatest predictive value lie within an area demarked by a point about 30 per cent above the most difficult end of the arbitrary scale and a point about 20 per cent below the least difficult end of the scale. The midpoint of best average predictive value lies near the mean of difficulty but toward the least difficult end of the arbitrary scale.

FREQUENCY OF REPUBLICANS AND DEMOCRATS AMONG EMINENT AMERICANS

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There is considerable agitation among political scientists looking toward the application of the principles and methods of the laboratory sciences toward the understanding of political affairs, and the replacement of speculation and allegation with verifiable facts. There is particular interest in the psychological aspects of political problems[1] and in the use of psychological methods in solving these problems.[2]

One of the most practical of these questions of political psychology is, what are the differences in personnel among the parties? With the end of securing some facts regarding this question the writer made an investigation of the frequency with which adherents of the two major parties, Republican and Democratic, are found among eminent Americans. The source for the data was Who's Who in America (Vol. XIII, 1924–1925). Tabulation was made of 1000 names (men only): the first 500 in the book; and then, in order that results might not be affected by several members of a family whose name begins with A and who might belong to the same party, the second 500 names were taken from the middle of the book, beginning with those whose names begin with N. These 1000 persons, representing approximately one-twenty-third of the men mentioned in the volume, may be regarded as a reliable sampling of the whole.

Upon examining the biographical records of these men one is struck by the fact that a very large number of them do not acknowledge any political affiliation. Of the 1000 examined, 635 or 63.5 per cent do not favor one party with sufficient warmth to warrant saying so. Some may withhold the information for supposedly diplomatic reasons. Many are probably independent voters. Probably the greater number, however, belong to the large group of non-voters who are estimated to number about 50 per cent of the population at large.

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[1] Merriam, C. E. The significance of psychology for the study of politics. Amer. Pol. Sc. Rev., August, 1924, 469–88.

[2] Dewey, A. Gordon. On methods in the study of politics. Pol. Sc. Quar., December 1923, 636–651; June, 1924, 218–233.

TABLE 1

OCCUPATION	PER CENT
Politician	5.7
Writer	14.5
Lawyer	11.4
Engineer	4.1
Educator	17.3
Clergyman	7.8
Scientist	5.6
Physician	6.8
Army and Navy	4.1
Artist	5.5
Miscellaneous	17.2
Total	100.0

One way of accounting for this large number of apparently indifferent persons is to say that they belong to professional groups that are typically uninterested in politics. Some light on this question may be secured from a previously published investigation based on Volume XI of Who's Who.[3] This showed the occupational distribution given in table 1. Among these groups, the writers, engineers, educators, clergymen, scientists, physicians and artists are usually alleged to be uninterested in politics; in the above table they total 65.6 per cent, about the same number as those in the present investigation who did not express political preference.

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[3] Kitson, H. D., and Culbertson, L. The vocational changes of one thousand eminent Americans. Vocational Guidance Magazine, I, March, 1923, pp. 128-130.

There were approximately a score of persons who admitted having been politically active on behalf of Prohibition, Populist and Progressive (1912) parties. Since they were so few they were not tabulated separately, but were included in the 63.5 per cent not expressing preference for the Republican or Democratic parties, and the tabulation was restricted to those persons affiliated with the two major parties. The latter numbered 365, divided between the two parties as follows: Republicans, 253, Democrats, 112. That is, of the eminent persons in America, who, in their biographies in Who's Who, confess allegiance to one or the other of the two major parties, 25.3 per cent are Republicans and 11.5 per cent, or less than half that number are Democrats. In order for this difference to be statistically significant it should be compared with the numerical difference between Republicans and Democrats in the population at large. It is generally conceded that the former outnumber the latter. By how much, however, can not easily be determined. Perhaps the popular vote in Presidential elections is as good a single measure as may be em-

TABLE 2

Popular votes for the Republican and Democratic presidential candidates 1892–1920

YEAR	REPUBLICANS	DEMOCRATS
1892	5,190,802	5,554,414
1896	7,035,638	6,467,946
1900	7,219,530	6,358,071
1904	7,628,834	5,084,491
1908	7,679,006	6,409,106
1912	3,483,922	6,286,214
1916	8,538,221	9,129,606
1920	16,152,200	9,147,353
1924	16,187,878	8,438,272
Total..............	79,116,021	62,875,473

ployed. This vote during the elections of the past thirty years, the probable span of the political activity of these persons, is shown in table 2.[4]

If these figures indicate approximately the ratio of Republicans and Democrats in the population at large, they show a difference over the past thirty years in favor of the former amounting to 8,490,952, which is 15 per cent larger than the number of Democrats. Among the eminent subjects of this investigation, however, there were 112 Democrats outnumbered by 253 Republicans. The difference is 141, or 126 per cent. It seems almost incontestable, therefore, that there is a marked tendency among eminent men of the country who are politically affiliated, to affiliate with the Republican party rather than the Democratic.

This fact, scientifically established, should now be explained. The explanation can not be a matter of prejudiced speculation or superficial conjecture. It should come rather from further investigation of the men concerned, from correlations between party preference and factors that may bear on it.

In such a complex thing as political preference there are probably several things that would constitute explanatory principles. One may be place of birth and residence. Another may be psychological—the type of mind that makes for eminence may also produce a tendency to be sympathetic with the Republican party. Measures have been made of the intelligence of the inhabitants of various parts of the country. A correlation between such measures and the votes cast in different regions might indicate a relation between intelligence and party affiliation. Whatever be the explanation it should come only in terms of scientifically investigated facts.

From this study in political psychology several significant conclusions emerge: (1) the majority of eminent Americans appear to be politically indifferent; at least, they do not confess party allegiance in their published biographies. If this omission means lack of interest it indicates that the country suffers from lack of political leadership on the part of those who ought to lead, a condition already described in the elaborate study of Non-voting by Merriam and Gosnell.[5] (2) Among the eminent Americans who acknowledged party membership, Republicans are found to be more than twice as numerous as Democrats. (3) The most interesting feature of the investigation is the demonstration that the personnel of political parties can be made a subject for scientific investigation. By means of scientific investigations such as the one here reported, much information may be secured about such questions as: the influence on party choice of place and data of birth; place of residence; political faith of father or husband; occupation, etc. *In short, there is reason to believe that by the assiduous application of scientific method,* such as is here illustrated, practical and theoretical politics may ultimately be emancipated from the field of speculation and mystery and may be grounded on a basis of facts.

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[4] Chicago Daily News Almanac and Year-book, 1925.

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[5] Merriam, C. E., and Gosnell, H. G. Non-Voting, Causes and Methods of Control. Chicago, University of Chicago Press. 1924.

"WANT" AND "SOLUTION" ADVERTISEMENTS

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The writers maintain that there are two major objectives in advertising: first, to make a reader *want*, and second, to present a *solution*, i.e., to show how his desire may be adequately satisfied by means of the advertiser's commodity. The writers maintain further that unless the individual feels a want it is almost useless to discuss the solution. Consequently, making a man want (if he does not already want) is the more fundamental of the two aims and, for the sake of advertising efficiency, should come first.[1]

The validity of this thesis might be established by contrasting experimentally the effectiveness of two sets of advertisements: one designed only to arouse wants, the other only to present the adequacy of the solution. However, as the survey of many advertisements demonstrates, very few advertisements play up only one of these objectives. Thus, to carry out an experiment contrasting these two elements as such would necessitate the preparation of the required advertisements. Such artificial advertisements have been used to good effect by some experimenters. In the present experiment, however, it was deemed better to avoid artificiality and to employ advertisements that have actually appeared in high-priced space. Also, it seemed better to make each advertisement complete as regards the presence of both "want" and "solution" elements, and to contrast the advertisements by contrasting the emphasis these elements received.

Roughly speaking, current advertisements may be classed in three groups: first, those emphasizing primarily the want;

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[1] For a complete statement of this proposition, see E. K. Strong, Jr., Psychology of Selling and Advertising, 1925.

second, those emphasizing primarily the solution; and third, those stressing both factors about equally. Since the majority of present day advertisements fall in the second group, examples of "solution" advertisements were easy to obtain. Examples of the first group—"want" advertisements—were far more difficult to find. Indeed, the majority of such specimens as were found had to be tinkered with to some extent to bring them into the first rather than the third group.

This investigation aims to measure the relative merit of stressing the "want" or the "solution" element in advertising, the effectiveness of each type being determined by the extent to which it makes memorable a trade-name. The investigation centers around forty advertisements, of which twenty emphasize the want element and twenty the solution element. The problem is not to measure the relative effectiveness of these two elements *as such,* but rather to measure the relative effectiveness of *two groups of advertisements* in both of which both elements appear, but with *contrasting* instead of equal emphasis. If significant differences are found under such conditions, it would seem that greater differences must be obtained if the two elements be definitely and precisely contrasted.

In the case of the ten advertisements reproduced below the trade-name appears on the average 3.3 times in the "want" advertisements and 4.5 times in the "solution" advertisements; and more space is devoted to describing the trade-named commodity in the latter group than in the former. This condition is characteristic of the entire forty advertisements used in the study. Now, many might agree that "want" advertisements are superior to "solution" advertisements in the case of readers who are not interested, while maintaining that once a reader is familiar with the product a "solution" advertisement is superior because it emphasizes the trade-name to a greater extent. It is a question, however, whether repetition of the name, and space devoted to a description of the article, contribute more to impressing the name on a reader's memory than does copy that arouses desire.

It is generally recognized, of course, that when prospective buyers are not familiar with the advertised commodity it is necessary to "educate" them. In doing so their wants are usually emphasized. But when they are familiar with the commodity the usual practice is to emphasize the trade-name, considerably at the expense of the want. Most authorities would probably agree that our "want" advertisements would be more efficient in educating prospects than our "solution" advertisements. But judging from the advertising that appears in current publications, most authorities would claim that our "solution" advertisements would be more effective in selling a specific trade-named commodity in contrast with competing trade-named commodities. This experiment is designed to throw light on this last point.

Consequently, these two types of advertisements are not here measured in terms of the desire they arouse for the goods but merely in terms of the extent to which the *trade-name is impressed on the mind of the reader.* If then a "want" advertisement (such as 10-W reproduced below), which devotes only one paragraph to the commodity and mentions the trade-name but *three* times, impresses that name upon the reader to a greater extent than does a "solution" advertisement (such as 10-S) which gives half of its space to the commodity and mentions the trade-name *five* times, we must conclude that "want" advertisements are superior to "solution" advertisements not only in the case of educating people to buy, but also in the case of *reminding them to buy a specific trade-named commodity.*

Below there are reproduced five pairs of advertisements illustrating the two types—"want" and "solution"—on which this investigation is based. The first three pairs are examples of "want" advertisements that were markedly superior to corresponding "solution" advertisements. The last two pairs are examples of the reverse. In each case, the experimental efficiency and margin of superiority is indicated (percentages taken from table 2).

Advertisement 10-W. 14 per cent superior to 10-S; experimental efficiency 40 per cent

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The big party she missed

For months she had been looking forward to this affair—probably the most gala event of the winter season.

And more than that—the man who was to take her was looked upon as the one real "catch" in her set.

A week before the big night she felt a dry, rasping hitch in her throat. She neglected it and kept right on going.

A few days later her throat was so inflamed she could hardly swallow food. And then a rapidly rising temperature.

The doctor ordered her to bed—and kept her there three days. On the evening she wanted most to feel fit, she was confined to the house like a little old lady—and the others were dancing.

Don't let sore throat throw you out of step with the pleasures you've planned.

Guard against this trouble by taking the simple precaution of using Dixol, the safe antiseptic. Have Dixol handy always in your bathroom. It is a valuable preventative for throat irritations and the more serious ills that so often follow.

DIXOL

Advertisement 10-S. Experimental efficiency 35 per cent.

FOR SORE THROAT

A Safe Antiseptic

Extra strains mean a lowering of bodily resistance and demand a precaution against infections.

Sore throat is a result of infection in the mucous membranes in the throat. The only way to prevent it is to ward against the germs that cause it; and the best way is by gargling the throat with an efficient antiseptic.

Dixol is not only an efficient antiseptic but is thoroughly pleasant to use, and safe at all times. It is the result of intensive scientific study of the infectious sources of sore throat. Dixol is specially prepared to specifically combat bacterial onsets upon the delicate, sensitive membranes that line the throat.

Even a slight sore throat is an annoying inconvenience. And a bad one means a fever and confinement to bed. Guard against any such attack by always keeping a bottle of Dixol handy on the bathroom shelf. And don't wait for a dry rasping hitch in the throat—gargle regularly with warm water and Dixol.

DIXOL

Advertisement 1-W. 15 per cent to 1-S; experimental efficiency 86 per cent

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From the diary of any Danton owner

I have found a car that is a true companion.

It never whimpers, never grumbles. What I want it to do it does—willingly, efficiently.

Wherever I want to go, it takes me—through heavy traffic without straining my nerves or my patience. It leaves the paved roads for rough roads without a murmur. Even seems to smile in the joy of going where few will follow. Seems to resent the rear end of a car ahead.

It holds the road and follows its course with something akin to instinct—like a horse that knows its way and needs but gentle guidance.

The contentment I feel behind its wheel makes my motoring a soothing pleasure. Its ready power and effortless performance let me relax when I drive. To sit and ride for hours is like being snugly settled at home in my big easy-chair, with the world flying by.

My Danton is healthy and vigorous, like a spirited animal in pink of condition. It is quite unfamiliar with repair shops, for it needs but little attention to keep it always in perfect trim. With a soft cloth I can renew its sleek appearance after any ordinary run. From my seat, in scarce half a second, I can at any time lubricate all moving body parts. No wonder there's never a whine from its stalwart frame.

Above all, I can always TRUST it.

Who wouldn't call such a car a Companion!

DANTON MOTOR CARS

Advertisement 1-S. Experimental efficiency 71 per cent

Economical, Care-Free Service
Far Above Its Price-Class

It is not too much to say that the Danton is one of the most skilfully engineered cars in America.

It is likewise true that in many processes of its production important economies, with better and finer results, have been achieved.

Translated into concrete terms, this means a car selling for considerably less than $1,000, that accelerates from 5 to 25 miles an hour in eight seconds; that delivers its reliable mileage at maintenance and operating costs so low as literally to amaze.

How Danton engineering saves the owner money is illustrated by a score or more of structural details.

In ordinary construction, the power impulses, however smooth the motor may be, are transmitted to the chassis, while shock and vibration due to road roughness are likewise transmitted to the motor. The front end of the Danton motor is mounted upon a floating platform spring, which actually increases motor smoothness and protects the motor from road shock.

So throughout the entire car—at every turn, advanced engineering and precision manufacturing save for the owner.

Thus, in the Danton the buyer gets a car that provides economy in the price, and even more important economy in the low cost for which it returns its reliable, care-free service.

DANTON MOTOR CARS

Advertisement 14-W. 13 per cent superior to 14-S; experimental efficiency 41 per cent

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Don't Take Your Shower in the Garden!

How often have you wished you had worn rubber boots and a raincoat when watering the lawn or garden? How often have wet shoes and clothing marked the end of what should have been an enjoyable task?

The user of Good Luck Garden Hose never experiences these annoyances. From the time he starts unrolling it to the time it is put away again, he finds his task an easy, even pleasurable, one. Good Luck hose is "built to stay alive" and give long unfailing service. It rolls and unrolls easily, lies flat and never kinks. It thus prevents the annoyance caused by "stubborn" hose; and since it will not kink it does away with the many leaks that waste water and sprinkle the user instead of what should be sprinkled.

You can keep dry and cheerful if you use Good Luck Garden Hose.

GOOD LUCK GARDEN HOSE

Advertisement 14-S. Experimental efficiency 28 per cent

Six Protecting Plies

Consider how Good Luck hose is made! Around the live rubber tube are six tightly wrapped layers or plies of stout cotton fabric filled with rubber gum and encased in a tough cover. Tube, plies and cover are all vulcanized together into a solid yet flexible wall. The result is a light, strong garden hose which gives years of service around house or garden. Good Luck Hose is "built to stay alive", because it is built of live materials combined with long manufacturing experience.

Good Luck Garden Hose has a ¾" water channel, because this is the logical size for hose to be used with house or lawn sill cocks. Sizes smaller than ¾" will not deliver all the water from ½" hose fittings, and larger sizes will not deliver enough more than ¾" to justify their increased weight and expense.

Ask your dealer to show you Good Luck Garden Hose.

GOOD LUCK GARDEN HOSE

Advertisement 4-W. 3 per cent inferior to 4-S; experimental efficiency 50 per cent

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"But, DOROTHY, salad forks go on the INSIDE!"

Dorothy changed the forks with a start. She resented Mary's tone of mingled surprise and reproval. But she resented more the fact that she *didn't* know where the salad forks went. No wonder, either. There were no salad forks at home, nor bouillon spoons, nor many of the other beautiful things they used at Mary's house. Dorothy felt as though she had missed much—because her mother hadn't enough silverware.

You should have enough silverware of beauty and correctness to make possible correct and gracious serving at every family meal. It should help your children to be so familiar with correct usage that good table manners are their natural inheritance.

But perhaps yours doesn't! Even now you may be "getting along" with silverware that falls short of your taste and desire—all because you fear the expense of purchasing the necessary pieces.

But you need not fear it. In House of Burgundy Silverplate you can complete your silver service at surprisingly little outlay. You may purchase in quantities as small as you desire the important niceties of table setting—bouillon spoons, salad forks, coffee spoons or serving pieces. Thus you may acquire, a little at a time, silverware whose beauty and durability will give you lasting satisfaction.

And when you need more pieces in the chosen pattern, you will be able to get them easily; for the leading dealers always have the newer House of Burgundy patterns in their stock.

HOUSE OF BURGUNDY SILVERWARE

Advertisement 4-S. Experimental efficiency, 53 per cent

Hidden Treasure

If the plating of a Super Plate spoon were peeled back at the two rest points, it would show clearly the exact meaning of the phrase, "Solid Silver Where It Wears". For the pieces that are in constant use—tea, dessert, soup and table spoons, breakfast and dinner forks—have hidden beneath the surface of a scientifically applied plate, little blocks of solid silver inlaid at the back of handle and back of bowl in the new Super Plate—Inlaid from the House of Burgundy.

All other pieces are scientifically plated to resist wear, making the most desirable table silver the discriminating hostess could ask for.

For nearly half a century the House of Burgundy has been manufacturing quality silver plate and has established for itself an enviable reputation *for high grade merchandise of superior quality and beautiful* design.

The price for this fine quality in a rare assortment of beautiful patterns is reasonable, and your jeweler will gladly quote you on whatever assortment you may be interested in.

HOUSE OF BURGUNDY SILVERWARE

Advertisement 8-W. 11 per cent inferior to 8-S; experimental efficiency, 28 per cent

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Little Harmonies
that make life more cheerful

"I want to tell you how happy Satinette has made me," writes Miss Agnes Miller of Chicago. "I have just finished enameling the furniture in my bedroom. A week ago my chiffonier was cherry, my bureau yellow maple, my chairs walnut, and my bed mahogany. Now everything is a perfect harmony of color, and my room is simply fairyland."

"Speaking of miracles," writes Mr. George Baker of Oakland, California, "I wish you could see my study-den now. Two years ago I partitioned off a room in the attic as my own quiet retreat. From time to time I added to its furnishings with old odds and ends from all over the house. Finally it looked like a storage attic of worthless cast-offs, for everything looked dingy and shabby and nothing matched. Last week I worked out a simple color scheme and started in with Satinette. Now my study-den is the cheeriest room in the whole house and my friends won't believe I worked the miracle myself."

Every man and woman will appreciate the experiences given above. It is no longer necessary to tolerate the annoyance of having furniture that doesn't "match", that's shabby and unattractive.

With Satinette Enamels it is so easy to create a harmonious and cheerful color scheme, so easy to make old pieces fresh and like new, that countless people are finding its use a simple and pleasant way to work miracles in brightening and re-juvenating their homes.

SATINETTE ENAMEL

Advertisement 8-S. Experimental efficiency, 39 per cent

The Mellow Beauty of Satinette

So clean, so clear is Satinette's white that it seems like driven snow. So easily does it wash that it seems like fine porcelain. So enduringly does it wear that Satinette woodwork goes year upon years,—without cracking, without yellowing, without losing its beautiful appearance.

There is nothing cold or harsh about it. It dries with a mellow, soft-toned *finish without rubbing*, and possesses colonial-like dignity that reflects warmth and refinement.

Like good china and fine linens, Satinette enameled woodwork is a possession that warrants pride and pays for itself in long service and enduring satisfaction.

China-like is the only word that describes the lustrous beauty of the Satinette finish.

SATINETTE ENAMEL

PROCEDURE

Twenty commodities were selected and two advertisements were prepared for each, one stressing the want element and the other the solution or commodity. In nearly all cases these were direct adaptations from advertisements in actual use. In other words, twenty pairs of companion advertisements were prepared—forty advertisements in all, each "want" advertisement having its corresponding "solution" advertisement. These advertisements were then split into two groups, so that Set A contained ten "want" and ten "solution" advertisements while Set B contained the *corresponding* ten "solution" and ten "want" advertisements. Thus each group had the full twenty commodities represented by an advertisement, while each group furnished a check against the other. In testing, the subjects were likewise divided into two groups, one for each set of advertisements. The general instructions in all cases were to look over the advertisements as the subjects saw fit, to read any they wished to read and to skip any that were uninviting. To put emphasis upon reading only what was of interest, a time limit of ten minutes was announced in three of the four experiments, with the explanation that the interval was too short for one to read all the advertisements in the set. And to insure against anyone remembering *all* the advertisements, ten merely extraneous advertisements were included in two of the four experiments.

The three tests

After the subject had finished, or when the time limit was up, the following tests were employed.

Test 1 was a recall test, the instructions being to write down on a sheet of paper all the trade-names that could be recalled.

Test 2 was a controlled association test. The twenty commodities were announced one by one and the subject was requested to write down the appropriate trade-name as each was called.

Test 3 was a recognition test. Twenty *new* trade-names were mixed in with the twenty used in the advertisements. If the subject recognized the name when announced or exhibited visually he recorded a "+," otherwise a "−." Two methods of scoring the recognition test data were employed. In the first case the per cents of correct recognitions were alone considered. In the second case the per cents of incorrect recognitions were subtracted from the per cents that were correct. The former probably measures the total impression made; the latter the extent to which the correct name is definitely fixed in mind.[2]

The four experiments

Because of differences in the subjects tested, and of some variation in the experimental procedure, four experiments may be denoted which are tabulated on page 356.

In any experiment it is necessary to eliminate the effect of extraneous factors so that the final figures will measure only the single factor under consideration. This was made possible by the experimental procedure outlined above. Individuals, for example, differ markedly in their ability to observe and remember. The effect of this extraneous factor is eliminated here in that each individual is tested with respect to an equal number of both kinds of advertisements, and consequently his superior or inferior memory affects equally both sides of the equation. The effect of differences in intrinsic interest in commodities was eliminated in that there was a "want" and a "solution" advertisement for each commodity, and so these differences also affect both sides of the equation. Again, it is recognized that the first and last advertisements in a series are better remembered than those in the middle of the series. The effect of this factor was eliminated in that each pair of individuals was supplied with a set of advertisements arranged in a different order. For example, the order given in table 1, below, is merely the order that obtained in the case of one pair of individuals.

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[2] These three tests would seem to measure the extent to which the *tradenames* were noticed and remembered. To get some idea of which *advertisements* are most thoroughly read and remembered, further studies are planned. In these, individuals will be tested on the subject matter of the advertisements; also on their ability to recognize the last paragraph of each advertisement.

EXPERIMENT NUMBER	SUBJECTS	ADS USED	RECALL	ASSOCIATION	RECOGNITION	TIME LIMIT
I	30 men and women not college students	No extras	√	√	Visual* presentation*	None
II	60 men and women from two classes in advertising	No extras	√	√	Visual	10 minutes
III	56 men and women from a class in elementary psychology	10 additional ads used	√	√	Auditory	10 minutes
IV	114 men and women from a class in elementary psychology	10 additional ads used	Omitted†	Given first in this case	Auditory	10 minutes

* The visual method was possibly a fairer test inasmuch as it more nearly approximated the original presentation of the tradename, it being a visual stimulus in the advertisements.

† This recall test was omitted in experiment IV since it was thought at the time that the results of this test might influence the response to the other two tests. There is no evidence, apparently, that it did.

New trade-names were substituted for names in actual use. And to obtain a fair assortment of names that were neither too easy nor too difficult to remember considerable experimentation was first carried out.

TABLE 1

Showing the experimental procedure

Half of the 50 individuals tested, handled Set A; the other half, Set B. The data show the percentage of individuals that recalled the trade-name.

TRADE NAMES	SET A			SET B		
	"Want" ads	"Solution" ads	Additional ads	"Want" ads	"Solution" ads	Additional ads
Danton Automobile	70	—	—	—	45	—
P & H Hoist	—	—	16	—	—	16
Empress of Cumberland Mediterranean Cruise	—	36	—	33	—	—
Dixol Antiseptic	—	21	—	34	—	—
Mecco Steel Chair	—	—	0	—	—	3
Thoro-bred Dog Biscuit	50	—	—	—	18	—
Durex Battery	24	—	—	—	18	—
Hallet & David Player Piano	—	—	3	—	—	7
Fireside Tomato Soup	—	26	—	17	—	—
Kool Kraft Suit	—	33	—	22	—	—
Perfection Motor Car Heater	—	—	18	—	—	24
Tru-flex Bedspring	19	—	—	—	12	—
House of Burgundy Silverware	4	—	—	—	5	—
Arch Preserver Shoe	—	—	18	—	—	5
Comfo Davenport Bed	—	5	—	21	—	—
Lista Blanca Toothpaste	—	29	—	28	—	—
Congoleum Rug	—	—	54	—	—	53
Mercury Auto Safety Light	13	—	—	—	11	—
Dixie Range	28	—	—	—	8	—
American Boy	—	—	50	—	—	45
Rayite Auto Enamel	—	23	—	17	—	—
Good Luck Garden Hose	—	8	—	30	—	—
Stewart Brons Bearing Metal	—	—	6	—	—	8
Logan Lawn Mower	15	—	—	—	26	—
Satinette Enamel	4	—	—	—	24	—
Thermotite Construction	—	—	25	—	—	20
Vapite Firefoam	—	16	—	17	—	—
Mytho Hair Color Restorer	—	8	—	12	—	—
Oakite Cleaning Material	—	—	8	—	—	0
Glowtone Shades	16	—	—	—	9	—
Averages	24.3	20.5	19.8	23.7	17.6	18.7
				24.3	20.5	19.8
Averages of Sets A and B				24.0	19.05	19.25
Ratios				126	100	101

TABLE 2

Showing the per cent of individuals who remembered the trade names of "want" and "solution" advertisements as measured by Recall, Association and Recognition Tests in experiments III and IV

(170 individuals tested)

	"WANT" ADS					"SOLUTION" ADS					DIFFERENCE (COLS. 5 AND 10)
	Recall	Association	Recognition (1)	Recognition (2)	Average	Recall	Association	Recognition (1)	Recognition (2)	Average	
Danton Automobile	70	81	96	96	86	45	59	91	90	71	15
Lista-Blanca Tooth paste	28	45	91	88	63	29	46	87	87	62	1
Fireside Tomato Soup	17	58	88	82	61	26	60	81	78	61	0
House of Burgundy Silverware	4	39	79	78	50	5	36	86	84	53	−3
Mercury Auto Safety Light	13	35	81	70	50	11	29	79	73	48	2
Comfo Davenport Bed	21	31	76	61	47	5	24	63	44	34	13
Vapite Firefoam	17	24	77	66	46	16	13	78	61	42	4
Satinette Enamel	4	18	55	36	28	24	32	63	37	39	−11
Tru-Flex Bed Springs	19	27	69	59	44	12	17	68	57	39	5
Dixol Antiseptic	34	38	64	58	49	21	11	53	40	35	14
Glow-tone Window shades	16	17	69	59	40	9	12	54	42	29	11
Dixie Ranges	28	21	66	59	44	8	27	76	61	43	1
Empress of Cumberland Mediterranean Cruise	33	56	96	96	73	36	54	88	86	66	7

Good Luck Garden Hose	36	29	62	38	41	8	17	53	32	28	13
Rayite Auto Enamel	17	17	65	25	31	23	12	58	24	29	2
Thorobred Dog Biscuit	50	43	91	87	68	18	54	86	85	61	7
Logan Lawn Mower	15	11	71	61	40	26	21	69	52	42	−2
Mytho Hair Color Restorer	12	24	77	68	45	8	13	77	58	39	6
Durex Battery	24	23	82	80	52	18	22	78	74	48	4
Kool Kraft Suit	22	41	92	92	62	33	33	92	91	62	0
Averages	24.0	33.7	77.4	68.0	51.0	19.1	30.4	74.0	62.8	46.6	4.4
Ratios	126	111	105	108	109	100	100	100	100	100	9

For the purpose of making the experimental procedure clear, the data secured in the Recall Test in experiment III is given below in table 1. In this experiment ten additional advertisements, the very same in both cases, were included in both Set A and Set B.[3] The figures in the table represent the percentage of individuals who recalled the trade-names. Thus, 70 per cent of the individuals who handled Set A recalled "Danton" after having seen the Danton "want" advertisement, whereas only 45 per cent of the individuals who handled Set B recalled that trade-name after having seen the companion Danton "solution" advertisement. The average percentage for the ten "want" advertisements in Set A was 24.3 per cent, in Set B, 23.7 per cent, a final average of 24.0 per cent. The average for the ten "solution" advertisements in Set A was 20.5 per cent, in Set B, 17.6 per cent, a final average of 19.05 per cent. This gives 26 per cent greater efficiency for the "want" advertisements.

RESULTS

"Want" advertisements are superior to "solution" advertisements

Table 2, presenting the data from experiments III and IV, shows the per cent of individuals who remembered the trade-names from "want" as compared with "solution" advertisements. The first five columns of data refer to the twenty "want" advertisements. The second five columns to the corresponding "solution" advertisements. Column 11 gives the differences between the two types of advertisements. Thus the trade-name in the "want" advertisement of Danton automobile is remembered by 86 per cent of 84 subjects, the trade-name in the "solution" advertisement by 71 per cent of 86 subjects, a difference of 15 per cent in favor of the "want" advertisement.

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[3] No significance should be attached to the data from the ten additional advertisements. They were selected at random and inserted merely for the purpose of enforcing a "weeding out" process in the case of the twenty other advertisements.

Columns 1 and 6 present the data from the Recall Test. This test was not used in experiment IV, so that the data are based on 56 individuals, not 170. Columns 2 and 7 present the data from the Controlled Association Test. Columns 3 and 8 give the results of the Recognition Test when only correct recognitions are considered; columns 4 and 9 when incorrect are subtracted from correct recognitions.

If the efficiency of the "solution" advertisements is expressed as 100 the "want" advertisements are 26 per cent superior, as based on the recall test; 11 per cent as based on the association test; 5 per cent as based on the recognition test (correct recognitions alone considered); and 8 per cent superior, as based on the recognition test where correct and incorrect recognitions are both considered. A final summary gives 9 per cent superiority of the "want" advertisements.

It is quite possible that others may not agree with us as to the classification of these forty advertisements. It may be that some of these advertisements are not good examples of "want" or "solution" advertisements, or so poorly worded as not to be interesting. It is even more likely that some of the wants that are appealed to in the "want" advertisements are common to older people but not particularly potent among college students. This may be the explanation as to why the "want" Satinette Enamel advertisement (8-W) was remembered by fewer persons than the "solution" advertisement (8-S).

Table 3 presents summaries of the four tests in experiments I to IV expressed in the form of ratios. (Table 2 presents the data from experiments III and IV combined.) Thus in the case of the Recall Test the "want" advertisements were found to be 8 per cent superior to the "solution" advertisements in experiment I, 10 per cent superior in experiment II and 26 per cent superior in experiment III. The average is 16 per cent when the three percentages are weighted according to the number of subjects in each experiment.

The summary of all tests in the four experiments gives a ratio of 111 to 100 in favor of the "want" advertisements.

Experiment I was a preliminary try-out. After experiment

TABLE 3

Showing the superiority of "want" advertisements to "solution" advertisements expressed in the form of ratios

The results of the three tests in the four experiments are presented; also a general summary.*

	EXPERIMENT I—30 SUBJECTS	EXPERIMENT II—61 SUBJECTS	EXPERIMENT III—50 SUBJECTS	EXPERIMENT IV—114 SUBJECTS	SUMMARY—261 SUBJECTS
1. Recall	108–100	110–100	126–100		116–100
2. Controlled Association	157–100	106–100	106–100	113–100	115–100
3a. Recognition: correct only	98–100	103–100	102–100	106–100	104–100
3b. Recognition: correct-incorrect		115–100	101–100	111–100	110–100
Final summary					111–100

* The A.D. of the difference of 6 per cent in the Controlled Association Test, Experiment III is 7.0. The 6 per cent difference is accordingly 0.86 times its A.D. The A.D. of the difference of 13.2 per cent in the Association Test, Experiment IV is 5.6. The 13.2 per cent is accordingly 2.4 times its A.D. The A.D. of the difference of 10.8 per cent in the Association test, Experiments III and IV combined (see table 2) is 4.6. The 10.8 is accordingly 2.3 times its A.D. On this basis the final difference of 11 per cent summarizing 14 tests must be judged a significant difference.

The amount of the average deviations of the averages is affected primarily by the number of subjects and whether the advertisements are all very well or poorly remembered on the one hand or remembered about half of the time on the other hand. (The A.D. of the Average would be much smaller if the advertisements were remembered by 90 per cent or 10 per cent of the subjects than if by 50 per cent of the subjects.) As advertisements were selected so as to include the whole range from well to poorly remembered the A.D. has been in a sense deliberately made large. The ratio of the difference to the A.D. of the difference, in addition to the above factors, is dependent upon the difference between "want" and "solution" advertisements. Here again the deliberate intention of the experimentors was not to use advertisements in which these elements were clearly distinguished but rather advertisements in which these elements were present, one being emphasized more than the other. It seems therefore that the consistency with which "want" advertisements are found superior to "solution" advertisements is a more reliable index of the significance of the final difference of 11 per cent than that to be obtained by statistical expressions of variability.

II was performed several of the advertisements were materially revised and fully half of the remainder were revised slightly. It is believed that the data in table 2 are accordingly more reliable than those of table 3, but for comparison both are presented. Whether "want" advertisements are 9 or 11 per cent superior to "solution" advertisements is immaterial. The significant point is that they are about 10 per cent superior when measured in terms of the memorability of the trade-name.

Any change in advertising is decidedly worthwhile that will increase the number of those who remember an advertised trade-name. This is particularly true if the more efficient advertising not only increases the memorability of the trade-name but at the same time is primarily designed to arouse a desire for the goods.

Advertisements are noticed and remembered to the extent that they appeal to existing interests

A measure of the extent to which each of the twenty *commodities* was noticed and remembered is given in column 1 of table 4. The percentages in this column are averages of columns 5 and 10 of table 2, i.e., the averages of the pairs of "want" and "solution" advertisements. Thus 79 per cent remember "Danton Automobile" while only 30 per cent remember "Rayite Auto Enamel."

Why is an auto trade-name remembered by more than twice as many persons as an auto enamel trade-name? The writers contend that this is the case, other things being equal, because an auto is of far more interest to young people than is an auto enamel. Our whole thesis is that people buy what they want, or have been made to want, they pay attention to and remember what they are interested in, and without interest and desire there is minimal attention or memory.

Experiment V was devised to throw some light on this point. Ninety-four college men and women were asked to arrange the twenty commodities (no trade-names were supplied) in order of merit according as they would buy them, on the supposition that they had more than enough cash to buy all of the twenty.

The order of merit from this experiment is given in column 3 of table 4. In column 2 is given the order of merit of the data in column 1. The correlation between columns 2 and 3 is 0.61.

TABLE 4

*Showing the extent to which the memory of trade-names is influenced by desire for the commodity**

	AVERAGE OF COLUMNS 5 AND 10, TABLE 2	ORDER OF MERIT, COLUMN 1	ORDER OF MERIT OF DATA FROM EXPERIMENT V	ORDER OF MERIT, COLUMN 2, WHEN ITEM NO. 3 IS OMITTED	ORDER OF MERIT, COLUMN 3, WHEN ITEM NO. 3 IS OMITTED
Danton Automobile	70	1	1	1	1
Empress of Cumberland Mediterranean Cruise	70	2	2	2	2
Thoro-bred Dog Biscuit	65	3	18		
Lista-Blanca Tooth Paste	63	4	4	3	4
Kool-Kraft Suit	62	5	3	4	3
Fireside Tomato Soup	61	6	11	5	11
House of Burgundy Silverware	52	7	5	6	5
Durex Battery	50	8	10	7	10
Mercury Auto Safety Light	46	9	7	8	7
Vapita Firefoam	44	10½	8	9½	8
Dixie Range	44	10½	9	9½	9
Mytho Hair Color Restorer	42	12½	19	11½	18
Dixol Antiseptic	42	12½	16	11½	16
Comfo Davenport Bed	41	14½	6	13½	6
Logan Lawn Mower	41	14½	15	13½	15
Glow-tone Window Shades	35	16½	14	15½	14
Good Luck Garden Hose	35	16½	12	15½	12
Satinette Enamel	34	18	17	17	17
Rayite Auto Enamel	30	19	13	18	13

* The item Tru-flex Bed Spring is omitted from this table because by error hosiery was substituted in Experiment V.

Only in the case of no. 16, Thoro-bred Dog Biscuit, is there any striking disagreement in the two orders of merit. This exception really proves the rule. In experiment V the subjects were given only the two words "dog-biscuit." Most naturally they would rate it very low. If the item had been "food for your dog," the rating would undoubtedly have been different. When the advertisements were before the subjects, the idea "dog" was more prominent in their minds than that of "dog-biscuit." The subjects responded to the advertisement in terms of their interest in dogs. If this item is disregarded the two orders of merit are obtained that appear in columns 4 and 5. The correlation in this case is 0.79.

Other things being equal, a person notices, reads and remembers those advertisements which deal with his desires. If he does not want a commodity he usually does not see the advertisement at all. It is useless to attempt to arouse interest; one must start with an already existing interest and build on it.

Actually a packing concern sells "dead cow." There is no interest in that and if so advertised there would be no sale. "Canned meat" is of more interest and most advertising has been on this basis. But women today are still more interested in "leisure time," time to play bridge, go to the movies, play with their children, etc. One advertiser is now selling "dead cow" by emphasizing "leisure time." Here is an example of the proper utilization of existing interests. By causing a woman to realize that time consumed in cooking meat could be saved by buying canned meat, a greater interest is attached to the canned meat than can be stimulated by any discussion of the qualities of the meat itself.

SUMMARY

1. It is maintained that there are two major objectives in advertising: first, to make a reader want, and second, to give a solution to show how his desire may be adequately satisfied by means of the advertiser's commodity.

Nearly all those writing on advertising copy have distinguished two general types of advertisements, or at least two general types of copy. These have been described in a variety of ways, such as: human-interest vs. reason-why, short-circuit vs. long-circuit, suggestion vs. argumentation copy. It is maintained that these classifications are inadequate. The two major objectives are: to arouse a want and to present a solution.

2. The basis of interest and the chief factor in memory is desire. It has been shown that the order in which trade-names are remembered is substantially the same order in which people are desirous of buying the commodity. One's interests cause one to read the advertisements that appeal to these interests and to remember the solutions to these desires, namely the trade-names.

3. Of the factors that strengthen a bond in learning the so-called factor of "effect" has not yet received its proper recognition, as contrasted with the emphasis given to "repetition," "intensity" and the like.

In this experiment the "want" advertisements contained fewer repetitions of the trade-name and less space devoted to describing the trade-name than the "solution" advertisements yet the "want" advertisements produced greater memorability of the trade-name.

4. The most efficient advertisements, other things being equal, are those that arouse a want for the commodity, even when the efficiency is measured not in terms of desire to buy, but in terms of the memorability of the trade-name.

This conclusion should not, however, be carried to an extreme. Not only must prospective buyers be made to want but they also must be convinced that the advertised commodity will be an adequate solution to their wants. Arousal of wants and satisfaction of those wants are the first and third steps in the whole process. But the intermediate step of convincing the prospect that the advertised solution will satisfy his wants must be present also.

PHENOMENAL MEMORIZING AS A "SPECIAL ABILITY"

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Theories of behavioral constitution have sometimes assumed the existence of special capacities in complex traits: peaks of talent rising conspicuously above an individual's general ability level. This doctrine finds a common expression in the belief that the feeble-minded tend to show a high development of "memory"—a widespread popular view, which has considerable support in psychological literature. Restated in terms of the distribution curve, the theory implies that individuals in the lowest percentiles in general ability may be found in the highest percentiles in the ability to memorize and retain simple material. We have, for example, the following statement by William James (1): "Imbeciles sometimes have extraordinary desultory memory . . . . the mere organic retentiveness of a man need bear no definite relation to his other mental powers."

Tredgold (2) observes: "In a considerable proportion of idiot-savants the gift is one of memory in some form or other, and of this many interesting and remarkable examples have been cited."

See also Forbes Winslow (3): "Idiots have exhibited the faculty of retention to a remarkable extent, and men of very limited and circumscribed powers of reasoning and of most defective judgment have had memories distinguished for their tenacity."

Similar references are frequently found, to "imbeciles with unusually tenacious memories," Ireland (4); to "remarkable memory for places exhibited in certain idiots of low mental capacity," Griesinger (5); or to "idiots found to possess a special faculty of storing in their brains . . . . masses of figures like railway time tables and budget statistics," Lancet (6).

Making allowance for the non-specific use of the terms idiot and imbecile, it is nevertheless apparent that many writers during the past few decades have agreed with Winslow in the opinion that "great vigor of memory is often conjoined with a low order of intelligence."

If we turned to the actual case records, we find very little beyond a repetition of the claims already stated, reinforced by anecdotes that are entertaining but not always persuasive. Tredgold cites the case of a patient in the Earlswood Asylum, who made a specialty of biographical history. "It is only necessary to mention to him the name of any prominent personage, in early or ancient history, and out there flows in a steady unhesitating stream a full account of his birth, life and death. His knowledge has been acquired by poring over biographical details in such books as were available. . . . ."

Barr (9) in connection with the problem of echolalia, gives the following report of an inmate of his institution:

> K. M. M., idio-imbecile, white, male, epileptic, aged twenty-two years. Healthy up to the age of sixteen months. He began to talk with the ease of a normal child, but early developed a habit of peculiar repetition. . . . . His precocious memory just at this period, coupled with these abnormal repetitions, first attracted the attention of those about him as evidencing something wrong. . . . . His memory is indeed phenomenal. He recalls not only the visits of his parents and other incidents occurring during the year, but also the names of boys and attendants he has neither seen nor heard of for years, and he will sit talking to himself of them. . . . . He catches readily both words and music of all the popular songs at first hearing, repeating the words almost verbatim.

Barr appeared to consider that he was dealing with a case of extraordinary capacity for both immediate and delayed memory. It is not clear, however, that the patient's echolalia involved an unusual degree of memory span; his memory for past events, to the extent that it was exceptional, could very likely be explained in terms of exceptional repetition and exercise. Institutional reports by physicians are often vaguely descriptive; "phenomenal" may mean phenomenal for the whole population, or merely phenomenal for the sampling of feeble-minded.

A characteristic case is reported in Lancet (6) for June 5, 1909.

> At a recent meeting of the Society for Psychiatry and Neurology, Dr. Witzmann showed a man aged twenty years, who possessed an extraordinary memory for certain of the data recorded in calendars. This individual, who was, moreover, an inmate of an asylum for the feeble-minded, could with the utmost readiness tell what day of the week it had been or would be on any given day of the month from the year 1000 to the year 2000. Although he has devoted much attention to the case, Dr. Witzmann has not yet succeeded in finding out by what means the young man has acquired this faculty.

It is safe to say that he acquired the "faculty" by normal processes of learning, and it may well be that in this as in the preceding cases the performance is due not to *skill* nor special *capacity* in memorizing, but to *patience* in memorizing, aided perhaps by mnemonic devices which any school child could use.

Dr. Witzmann's subject is similar to one reported by Byrd (8), a feeble-minded negro who could name the day of the week on which any day would fall from 1900 to 1924; he had a special interest in railroads, which led him to memorize locomotive engine numbers and the names of stations on railway routes. In the Stanford Revision his basic was 4 years, with an M.A. of between 8 and 9. His auditory digit span was 5. Asked to explain his memory for dates, he declared that this information came to him in a mysterious way (!), he did not know exactly how. From a notebook which he carried with him, however, it was obvious that he had acquired his information by a process of tedious memorizing. No explanation was advanced for the origin of his interest in these matters.

During the past twenty years the work of numerous investigators has shown a positive correlation between intelligence and the scores obtained on memory tests. Burt, Brown, Simpson, Wyatt, Gates, Starch, Jones, Lee and others report coefficients ranging from 0.30 to 0.90, with a central tendency of about 0.50. (This is based on 27 correlations, and is almost certainly too low, owing to errors of measurement in the earlier studies, some of which employed an unsatisfactory technique for determining intelligence, and some of which used too short a series of memory tests.) With a correlation of 0.50 or higher, the chances are extremely small that an individual falling 3 P.E. or more below the mean in intelligence will fall 3 P.E. or more above the mean in memorizing ability: a condition called for in the theory of the memory idiot-savant. The reputed frequency of these idiot-savants (Tredgold) may be an incorrect estimate through (*a*) inaccurate diagnosis of feeble-mindedness, (*b*) gross exaggeration of memorizing ability, due to failure to make objective tests of memory and retention or (*c*) confusion of ability factors with factors of interest and drive.

THE CASE OF K.

The writer sought to avoid these errors in studying the case of K., a phenomenal memorizer with a wide "professional" reputation. K. claimed to have a ready command of the following assortments of facts:

1. The population, by the 1920 census, of every town and city in the United States over 5000. (He had previously learned the population of all towns over 2000, by the 1910 census, but this obsolete information he was now "trying to forget.")
2. The names, the number of rooms, and the location of about 2000 leading hotels in the United States.
3. The county seats of all counties in the United States.
4. The populations of 1800 leading foreign cities.
5. The distances of all cities in this country from New York and from Chicago, and also the distance from each city or town to the largest city in its state.
6. Statistics concerning 3000 mountains and rivers.
7. The dates and essential facts connected with over 2000 leading inventions and discoveries.

In addition, he professed to have acquired a vast stock of "unclassified" facts from geography and history.

Tests in all of these fields showed that his claims were substantially correct. In giving the population of a random sampling of 50 cities from 5000 to 200,000 inhabitants, he recited 250 figures. Only 14 digits were incorrect or in the wrong order, his accuracy score being 95 per cent. In the case of the larger cities errors were rarely made; the median reaction time was 1.4 seconds, nearly as fast as his time in free association. For cities and towns under 20,000 population, the median reaction time was 2.9 seconds, with an obviously much reduced automaticity of response.

It was found moreover that K. had learned his associations both ways (deliberately, of course, and not incidentally). The following is a sample record made in a test before a class:

Q. 74,684
A. San Diego, Cal.

Q. 83,252
A. Savannah, Ga.

Q. 8,481
A. Conshocton, Pa.

Q. 25,739
A. Saskatchewan, Can.

Q. 176,467
A. Lima, Peru.

There were no errors, and the reaction times ranged from 0.8 to 3.2 seconds. Backward associations were found in all of the classifications of facts that he had acquired. An hour's examination could sample not more than from 2 to 4 per cent of the total array of statistical information that he had available for direct recall. The striking thing in this record is not the gross number of known facts (doubtless equalled or surpassed by the average well-informed person) but the nature of the facts and the manner in which they are organized. The items in K.'s equipment are of so discrete and "bookish" a character that they possess a minimum of transfer value. In learning them, and in later rehearsal, it is necessary to give specific drill to each item; one would suppose that very little logical assembling is possible. In the course of years, however, K. has acquired so many associations with combinations of digits, that it is difficult to give him a number which he cannot analyze into a familiar sequence. Thus he is able to learn numbers in terms of suggested and symbolized earlier memories. When given the number 4836179621 he studied it for 35 seconds, and gave a recall without error after a 4-hour interval. He describes his method as follows:

> When I saw this number I read it as 4,836,179,621. I remembered 4 because of the 4th of July. 836 I just had to memorize, without any help, but if I were doing it again it would probably occur to me that 836 was the Chinese population of the state of Texas in 1910, and then I couldn't forget it. 179 is easy to remember because that is the number of miles from New York to Harrisburg, and 621 is the number of a house I know of in Denver, Colorado.

By these linkages he was able to reduce the number from 10 to 4 units; I found that he was equally facile in attaching meanings to other number sequences. In some instances, if no associations were available, he would modify the number slightly and remember the modification. Thus, 30249385274 was divided into 30,249,385,274 and promptly assigned the following associations:

> 30 is the number of days in a month. 249—if that were 149 it would be the distance from Chicago to Peoria, Illinois. 385—I once paid $3.85 railroad fare going from Cheyenne, Wyoming to Wheatlands, Wyoming. 274—I can remember that by putting a 6 in front of it for the time being; 6274 is the seating capacity of the Hippodrome.

Such complications must tend to increase interference effects, which in any case would be expected to be large, due to the frequent similarity and overlapping of number series.

> I can memorize things best when I see them on paper, and best of all when I write them down. Anything new I usually like to write three or four times so as to be sure not to forget it. About once a year I try to brush up everything I know, and go over all the facts in my notebooks.

It would require nearly a week of full working days to give each connection a single recall. In his daily occupation as a sideshow performer, a certain proportion of his facts are greatly overlearned. Others, however, may perhaps never be exercised on the demonstration platform, and must be subject to a systematic rehearsal if they are to be retained.

K. was given four interviews of from two to three hours each, with measurements of specific memory abilities, a test of general intelligence, and a detailed inquiry into the early history of his obsession for facts.

Intelligence test results

With a chronological age of 38, K. obtained a mental age of 11 years 10 months in the Stanford Revision, with an I.Q. of 0.74 (0.79 on the 15-year hypothesis.) Coöperation was excellent. All of the tests were passed at the 9-year level, and none at year 16. His vocabulary (58 words) was superior to his other abilities, as might be expected from the fact that since 1911 he has been connected with exhibits, and has been encouraged to develop a verbose platform manner. He was unable to pass the memory for designs at 10 years, nor the digits reversed, fables, nor dissected sentences at 12 years. The following typically inadequate responses may be quoted, from the fable interpretations:

> *The Fox and the Crow:* "In the first place, there was deception there. Both deception and selfishness, that was the motive."
>
> *The Milkmaid and her Plans:* "It teaches us some lesson to profit by. She spilt the milk on the old dress. But what was she worrying about? She could get some more milk soon, and then she could buy a new dress."

He was unable to grasp verbal material except in small units; in such a test as the Problems of Fact, each sentence had to be read twice before he could comprehend the situation; his reactions to this test (14-year level) were similar to those commonly obtained from 12-year-old children. An attempt to give the Army Alpha was abandoned because of his confusion in taking directions.

Results on tests of memorizing ability

1. Digit span, auditory presentation (one per second). Six digits were repeated correctly on three successive trials. Three trials with 7 digits resulted in uniform failure. Six digits are placed by Terman at the 10-year level.

2. Paired associates, visual presentation. A test was used comprising 24 paired associates, taken from the Kent-Rosanoff frequency tables, and including equal numbers of associates of high, medium, low and "unique" frequency. In each case the S and R terms are common words of one or two syllables. The score in an immediate recall (with visual presentation of the stimulus word) was 33 per cent. In the writer's standardization of this test on college students, the median score for immediate recall is 74 per cent.

3. *Logical memory, auditory presentation.* The Marble Statue test (7) was given and scored by the method of retained members. K. obtained a score of 34, which corresponds to the norm for male 12-year-olds (34.7, 156 cases) and is approximately 1 P.E. below the average for adults (Pyle's norms).

It appears from this evidence that K.'s capacity for verbal learning (as measured by immediate recall for memorizing *confined to a standard period) is inferior to the adult norms,* and is in fact close to the level achieved in his test of general intelligence. We are not then confronted with the task of explaining a high memory ability coupled with a dull intelligence, but rather with the analysis of the *drive* which has led a person with inferior general capacities (as inferior in his special field of memorizing as in other functions) to devote his life to pseudo-intellectual activity.

Personal history

Certain facts of K.'s early history are suggestive. His social maturing was slow, and he appears to have had difficulty making ordinary adjustments in school, not only because of his retarded mentality, but also on account of a speech impediment and a markedly effeminate manner.

> I didn't play with the boys when I was small. I played with the girls. The boys were too rough. I didn't like outdoor games, but mostly preferred to stay at home and look at railroad maps, and figure out places to go on the map, and the names of towns I could go to.

He developed a passion for measuring and counting.

> One month I counted the number of bites of food I took, and it was 9,510 bites. I counted the number of steps doing chores around the house, and the number of steps from our door-step to the post-office four miles away. I bought a yardstick and measured how far it was to a spring in the woods, and it was 223 yards.

These exhaustive scientific inquiries were rewarded by a notice in the local newspaper. Isolated from ordinary social contacts, he lived in a fantasy world of numbers.

K. received much encouragement from his mother, who regarded herself as possessing unusual memory abilities, and liked to think of the son as following in her footsteps. It is difficult to estimate to what extent K.'s later interests were determined by a mother identification. He volunteered:

> I used to like to sit in a rocking chair the way my mother did; I liked to play with dolls and dishes, and help around the house. My mother always taught me to be quiet and refined and to have nice manners, and I've always tried to be just the way she taught me.

His pious effeminacy was carried to the point of using the girls' toilet in school, a practice permitted by the teacher until he reached the age of fifteen.

K. left school when seventeen years old, being unable to pass beyond the seventh grade; in spite of his alleged prowess in memory, he was inferior in school work and, as now, generally deficient in social and practical information. His career as a "memory artist" began a few years later, when he was promised an engagement in a vaudeville circuit if he would memorize the 1910 census for towns over 2000 in population; he claims to have accomplished this feat in about three weeks, working from six to eight hours a day. Since then he has gradually added new systems of data to his professional equipment; he has compiled a handbook of 130 pages, and is now at work on a larger compendium. Steeped in scholarship and dripping with facts, he is under a compulsion to talk shop at every opportunity. When on tour, his letters read like an abstract from the World Almanac; no statistical morsel is too slight to be mentioned.

Probably because of sensitiveness to the fact of underdevelopment, he refused to submit to a physical examination. His present appearance is fairly typically eunuchoid, undersized, with a high-pitched voice, hyper-extensible wrists, scanty beard, wide hips, and a suggestion of eunuchoid fat distribution. 'He was late in entering puberty, and states that he had no knowledge of the facts of sex before the age of seventeen (an item which I find entirely credible). He frequently recurs to his boyhood dependence on his mother, and to the fact that he has always suffered from the ridicule and practical jokes of male associates. An obvious inference is that his interest in memorizing has in large part served as a compensation for an inferiority reaction. His platform performances have taken on a ritual character, with a clear exhibitionistic coloring; under the influence of his advertising posters, he has begun to regard himself as a genius.

The salient features of the case are: (1) Gonadal inferiority: eunuchoid constitution; (2) intellectual and social inferiority; (3) extraordinary memorizing as a mechanism of (*a*) direct compensatory adjustment and (*b*) mother identification.

It is suggested that future reports on special proficiencies in complex traits be accompanied by objective records of the traits in question, and a developmental history. If the concepts "idiot-savant" and "genius" are worth preserving, it may be that the first will come to bear the same relation to mental defect that the second bears to mental superiority: the differences at each level being statable not in terms of general or special capacity, but in terms of an atypically focalized habit system. The weight of evidence remains in favor of Thorndike's canon (10): "In original nature, the rule is correlation, not compensation." Compensating traits, when shown to occur, should always be considered in the light of genetic analysis.

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TABLE OF STANDARD ERRORS AND PROBABLE ERRORS OF PERCENTAGES FOR VARYING NUMBERS OF CASES[1]

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This table was evolved to meet the immediate research needs of our staff at the University of Minnesota. It has already demonstrated its serviceability during the past year, having aided graduate students and instructors in carrying out three extensive pieces of research. The computational work in these researches would have been nearly prohibitive had this table not been available; hence we are certain that this labor saving table will be welcomed by workers dealing with material involving the standard errors or probable errors of percentages.

DERIVATION OF TABLE

The formula as given by Yule for the standard error of a proportion is:

$$\sigma_p = \sqrt{\frac{pq}{n}}$$

where p equals the percentage or proportion, q equals the difference between p and 1.00, and n equals the number of cases.[2] Since p always varies between 0.0 and 1.00 and q always varies between the same limits, and since the products of *pq* can be determined in advance for all the possible varying combinations from 0.01 and 0.99 to 0.50 and 0.50, we are able to draw up the table in such a way as to show the square roots of any of these combinations divided by varying numbers of cases. Across the top of the table (at the head of each column) are to be found all of the possible values of *p*. In the first column of the table are given various values of σ_p ranging from 0.100 or 10 per cent (where σ_p is a maximum for a percentage of 50 based on 25 cases) to 0.001 or 0.1 per cent (where σ_p is a minimum for a percentage of 50 based on one million cases). These σ_p values vary from 0.001 to 0.100 by successive steps of 0.001 intervals; hence there are one hundred σ_p values.

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[1] Edgerton is responsible for the actual development of this table following out the suggestion of Paterson. Both authors are responsible for the accompanying descriptive material.

[2] G. Udney Yule: An Introduction to the Theory of Statistics, p. 257, formula (2), J. B. Lippincott, 1924.

The main body of the table, showing varying numbers of cases, was built up from the various combinations of *pq* and the varying values of σ_p shown in the first column of the table. Twenty-five cases were arbitrarily taken as the minimum number, since proportions based on any smaller number would be of very doubtful validity. The upper limit of cases is one million, which was fixed by the requirement of showing a standard error as small as 0.001 for a percentage of 50. These various limits should meet the needs of most psychological studies involving the computation of standard errors of percentages.

To facilitate calculations involving the standard error of the difference between percentages we have included in the second column of the table the squares of the σ_p values. The conversion of these σ_p values and their squares into PE values and their squares was also computed and entered in the last two columns of each page in order that the significance of the difference between percentages could as readily be determined on the basis of probable errors as on the basis of standard errors. This conversion for PE_p was made by multiplying the various σ_p values by 0.6745 carrying the product to four decimal places. These four place products were then squared to give PE^2_p values to the eighth decimal place. The PE_p values in the table are printed only to the third decimal place and the PE^2_p values in the table are printed only to the sixth decimal place.

EDGERTON'S TABLE OF STANDARD ERRORS AND PROBABLE ERRORS OF PERCENTAGES FOR VARYING NUMBER OF CASES

σ_p	σ^2_p	50%	49–51%	48–52%	47–53%	46–54%	45–55%	44–56%	43–57%	42–58%	41–59%	PE^2_p	PE_p
.100	.010000	25	25	25	25	25						.004513	.067
.099	.009801	•	•	•	•	•	25	25	25	25		.004440	.067
.098	.009604	26	26	26	26	26	26	•	•	•	25	.004369	.066
.097	.009409	•	•	•	•	•	•	26	26	26	•	.004277	.065
.096	.009216	27	27	27	27	27	27	27	•	•	26	.004190	.065
.095	.009025	•	•	•	•	•	•	•	27	27	27	.004096	.064
.094	.008836	28	28	28	28	28	28	28	28	•	•	.004020	.063
.093	.008649	29	29	29	29	29	•	•	•	28	28	.003913	.063
.092	.008464	•	•	•	•	•	29	29	29	29	•	.003841	.062
.091	.008281	30	30	30	30	30	30	30	•	•	29	.003765	.061
.090	.008100	31	31	31	31	31	•	•	30	30	30	.003681	.061
.089	.007921	•	•	•	•	•	31	31	31	31	•	.003600	.060
.088	.007744	32	32	32	32	32	32	32	32	•	31	.003516	.059
.087	.007569	33	33	33	33	33	33	•	•	32	32	.003431	.059
.086	.007396	34	34	34	34	•	•	33	33	33	33	.003361	.058
.085	.007225	35	•	•	•	34	34	34	34	34	•	.003263	.057
.084	.007056	•	35	35	35	35	35	35	35	•	34	.003201	.057
.083	.006889	36	36	36	36	36	36	36	36	35	35	.003125	.056
.082	.006724	37	37	37	37	37	37	37	•	36	36	.003058	.055
.081	.006561	38	38	38	38	38	38	38	37	37	37	.002981	.055
.080	.006400	39	39	39	39	39	39	•	38	38	38	.002905	.054
.079	.006241	40	40	40	40	40	40	39	39	39	39	.002830	.053
.078	.006084	41	41	41	41	41	41	41	40	40	40	.002767	.053
.077	.005929	42	42	42	42	42	42	42	41	41	41	.002694	.052
.076	.005776	43	43	43	43	43	43	43	42	42	42	.002621	.051
.075	.005625	45	45	44	44	44	44	44	44	43	43	.002550	.051
.074	.005476	46	46	46	46	45	45	45	45	45	44	.002490	.050
.073	.005329	47	47	47	47	47	47	46	46	46	46	.002421	.049
.072	.005184	48	48	48	48	48	48	48	47	47	47	.002352	.049
.071	.005041	50	50	50	50	49	49	49	49	49	48	.002285	.048
.070	.004900	51	51	51	51	51	51	51	50	50	50	.002228	.047
.069	.004761	53	53	53	53	52	52	52	52	51	51	.002162	.047
.068	.004624	54	54	54	54	54	54	54	53	53	53	.002098	.046
.067	.004489	56	56	56	56	56	55	55	55	55	54	.002034	.045
.066	.004356	58	58	58	58	57	57	57	57	56	56	.001980	.045
.065	.004225	60	60	59	59	59	59	59	58	58	58	.001918	.044
.064	.004096	62	61	61	61	61	61	61	60	60	59	.001855	.043
.063	.003969	64	63	63	63	63	63	63	62	62	61	.001798	.042
.062	.003844	66	66	65	65	65	65	65	64	64	63	.001747	.042
.061	.003721	68	68	68	68	67	67	67	66	66	66	.001689	.041
.060	.003600	70	70	70	70	70	69	69	69	68	68	.001632	.040
.059	.003481	73	73	72	72	72	72	71	71	71	70	.001570	.040
.058	.003364	75	75	75	75	75	74	74	74	73	73	.001520	.039
.057	.003249	78	78	78	78	77	77	77	76	76	75	.001475	.038
.056	.003136	81	81	81	80	80	80	79	79	79	78	.001421	.038
.055	.003025	84	84	84	83	83	83	82	82	82	81	.001369	.037
.054	.002916	87	87	87	87	86	86	86	85	85	84	.001325	.036
.053	.002809	90	90	90	90	90	89	89	88	88	87	.001274	.036
.052	.002704	94	94	94	93	93	93	92	92	91	91	.001225	.035
.051	.002601	98	97	97	97	97	97	96	96	95	94	.001178	.034

EDGERTON'S TABLE OF STANDARD ERRORS—Continued

σ_p	σ^2_p	50%	49–51%	48–52%	47–53%	46–54%	45–55%	44–56%	43–57%	42–58%	41–59%	PE'_p	PE_p
.050	.002500	102	101	101	101	101	101	100	100	99	98	.001136	.034
.049	.002401	106	106	106	105	105	105	104	104	103	102	.001089	.033
.048	.002304	110	110	110	110	110	109	109	108	107	107	.001043	.032
.047	.002209	115	115	115	115	114	114	113	113	112	111	.001005	.032
.046	.002116	120	120	120	120	119	119	119	118	117	116	.000961	.031
.045	.002025	126	126	126	125	125	124	124	123	123	122	.000916	.030
.044	.001936	132	132	131	131	131	130	130	129	128	127	.000876	.030
.043	.001849	138	138	138	137	137	137	136	135	134	133	.000837	.029
.042	.001764	145	145	144	144	144	143	143	142	141	140	.000801	.028
.041	.001681	153	152	152	151	151	150	150	149	148	147	.000762	.028
.040	.001600	160	160	159	159	159	158	157	157	156	155	.000724	.027
.039	.001521	168	168	168	168	167	166	166	165	164	163	.000689	.026
.038	.001444	177	177	177	177	176	175	175	174	173	172	.000655	.026
.037	.001369	187	187	187	186	186	185	184	183	182	181	.000620	.025
.036	.001296	198	198	198	197	197	196	195	194	193	191	.000588	.024
.035	.001225	210	209	209	209	208	207	207	205	204	203	.000557	.024
.034	.001156	222	222	222	221	221	220	219	218	217	215	.000524	.023
.033	.001089	236	236	236	235	235	234	233	232	230	229	.000493	.022
.032	.001024	251	251	251	251	250	249	248	247	245	243	.000462	.022
.031	.000961	268	268	268	267	267	266	264	263	261	260	.000437	.021
.030	.000900	287	287	286	286	285	284	283	281	279	277	.000408	.020
.029	.000841	307	307	307	306	305	304	303	301	299	297	.000380	.020
.028	.000784	330	330	330	329	328	327	325	324	322	319	.000353	.019
.027	.000729	355	355	355	354	353	352	350	349	346	344	.000331	.018
.026	.000676	384	384	383	383	382	380	378	376	374	372	.000306	.018
.025	.000625	416	416	416	414	413	412	410	408	405	402	.000282	.017
.024	.000576	452	452	452	451	449	448	446	443	441	438	.000259	.016
.023	.000529	493	493	493	492	490	488	486	484	481	477	.000240	.016
.022	.000484	540	540	539	538	537	535	533	530	526	523	.000219	.015
.021	.000441	594	594	593	592	591	588	586	583	579	575	.000199	.014
.020	.000400	657	657	656	655	653	650	647	644	640	636	.000180	.013
.019	.000361	730	730	729	727	725	723	719	716	711	706	.000161	.013
.018	.000324	816	816	815	813	811	808	804	800	795	789	.000146	.012
.017	.000289	918	917	916	914	912	909	905	900	894	888	.000130	.011
.016	.000256	1040	1040	1038	1036	1033	1030	1025	1020	1013	1006	.000114	.011
.015	.000225	1189	1188	1187	1184	1181	1177	1171	1165	1158	1150	.000102	.010
.014	.000196	1371	1371	1369	1366	1362	1358	1351	1344	1336	1327	.000088	.009
.013	.000169	1600	1599	1597	1594	1589	1584	1576	1568	1559	1548	.000076	.009
.012	.000144	1890	1889	1887	1883	1878	1871	1863	1853	1841	1829	.000064	.008
.011	.000121	2267	2266	2263	2259	2253	2244	2234	2223	2209	2194	.000054	.007
.010	.000100	2770	2768	2765	2760	2752	2742	2730	2715	2699	2680	.000045	.007
.009	.000081	3460	3458	3454	3447	3438	3425	3410	3392	3371	3348	.000036	.006
.008	.000064	4444	4442	4437	4428	4415	4400	4380	4357	4330	4300	.000028	.005
.007	.000049	5917	5914	5907	5895	5879	5857	5831	5801	5765	5725	.000022	.005
.006	.000036	8264	8261	8251	8234	8211	8181	8145	8102	8052	7996	.000016	.004
.005	.000025	12345	12340	12325	12301	12266	12222	12167	12103	12020	11945	.000011	.003
.004	.000016	20408	20399	20375	20334	20277	20204	20114	20008	19886	19746	.000007	.003
.003	.000009	40000	39984	39936	39856	39744	39600	39424	39204	38976	38704	.000004	.002
.002	.000004	111111	111066	110933	110711	110400	110000	109511	108900	108266	107511	.000002	.001
.001	.000001	1000000	999600	998400	996400	993600	990000	985600	980100	974400	967600	.000000	.001
σ_p	σ^2_p	50%	49–51%	48–52%	47–53%	46–54%	45–55%	44–56%	43–57%	42–58%	41–59%	PE'_p	PE_p

EDGERTON'S TABLE OF STANDARD ERRORS—Continued

σ_p	σ^2_p	40–60%	39–61%	38–62%	37–63%	36–64%	35–65%	34–66%	33–67%	32–68%	31–69%	PE'_D	PE_D
.100	.010000											.004543	.067
.099	.009801											.004449	.067
.098	.009604	25	25									.004359	.066
.097	.009409	*	*	25	25							.004277	.065
.096	.009216	26	26	*	*	25						.004186	.065
.095	.009025	*	*	26	26	*	25	25				.004100	.064
.094	.008836	27	27	*	*	26	26	*	25			.004020	.063
.093	.008649	28	*	27	27	*	*	26	*	25		.003931	.063
.092	.008464	*	28	28	*	27	27	*	26	*	25	.003844	.062
.091	.008281	29	29	*	28	28	*	27	*	26	26	.003758	.061
.090	.008100	*	*	29	29	*	28	28	27	27	*	.003684	.061
.089	.007921	30	30	30	*	29	29	*	28	*	27	.003600	.060
.088	.007744	31	31	*	30	30	*	29	*	28	*	.003516	.059
.087	.007569	32	*	31	31	*	30	*	29	29	28	.003434	.059
.086	.007396	*	32	32	*	31	31	30	30	*	29	.003364	.058
.085	.007225	33	33	*	32	32	*	31	*	30	*	.003283	.057
.084	.007056	34	34	33	33	33	32	32	31	31	30	.003201	.057
.083	.006889	35	*	34	34	*	33	*	32	*	31	.003125	.056
.082	.006724	36	35	35	35	34	34	33	33	32	32	.003058	.055
.081	.006561	37	36	36	*	35	35	34	34	33	33	.002981	.055
.080	.006400	*	37	37	36	36	*	35	*	34	*	.002905	.054
.079	.006241	38	38	38	37	37	36	36	35	35	34	.002830	.053
.078	.006084	39	39	39	38	38	37	37	36	36	35	.002767	.053
.077	.005929	41	40	40	39	39	38	38	37	37	36	.002694	.052
.076	.005776	42	41	41	40	40	39	39	38	38	37	.002621	.051
.075	.005625	43	42	42	41	41	40	40	39	39	38	.002550	.051
.074	.005476	44	44	43	43	42	42	41	40	40	39	.002490	.050
.073	.005329	45	45	44	44	43	43	42	42	41	40	.002421	.049
.072	.005184	46	46	46	45	45	44	43	43	42	41	.002352	.049
.071	.005041	48	47	47	46	46	46	45	44	43	43	.002285	.048
.070	.004900	49	49	48	48	47	47	46	45	45	44	.002228	.047
.069	.004761	51	50	50	49	49	48	47	47	46	45	.002162	.047
.068	.004624	52	52	51	51	50	49	49	48	47	46	.002098	.046
.067	.004489	54	53	53	52	52	51	50	49	49	48	.002034	.045
.066	.004356	55	55	54	54	53	53	52	51	50	49	.001980	.045
.065	.004225	57	57	56	56	55	54	53	53	52	51	.001918	.044
.064	.004096	59	58	58	57	57	56	55	54	53	53	.001858	.043
.063	.003969	61	60	60	59	58	58	57	56	55	54	.001798	.042
.062	.003844	63	62	62	61	60	60	59	58	57	56	.001747	.042
.061	.003721	65	64	64	63	62	62	61	60	59	58	.001689	.041
.060	.003600	67	67	66	65	65	64	63	62	61	60	.001632	.040
.059	.003481	70	69	68	68	67	66	65	64	63	62	.001578	.040
.058	.003364	72	71	71	70	69	68	67	66	65	64	.001520	.039
.057	.003249	75	74	73	73	72	71	70	69	68	67	.001475	.038
.056	.003136	77	77	76	75	74	73	72	71	70	69	.001421	.038
.055	.003025	80	80	79	78	77	76	75	74	73	72	.001369	.037
.054	.002916	83	83	82	81	80	79	78	77	76	74	.001325	.036
.053	.002809	87	86	85	84	83	82	81	80	78	77	.001274	.036
.052	.002704	90	89	88	87	86	85	84	83	82	80	.001225	.035
.051	.002601	94	93	92	91	90	89	87	86	85	83	.001178	.034

EDGERTON'S TABLE OF STANDARD ERRORS—Continued

σ_p	σ^2_p	40–60%	39–61%	38–62%	37–63%	36–64%	35–65%	34–66%	33–67%	32–68%	31–69%	PE^2_p	PE_p
.050	.002500	97	97	96	95	94	92	91	90	88	87	.001130	.034
.049	.002401	102	101	100	99	97	96	95	93	92	90	.001080	.033
.048	.002304	106	105	104	103	102	100	99	97	96	94	.001013	.032
.047	.002209	110	110	108	107	106	105	103	102	100	98	.001005	.032
.046	.002116	115	114	113	112	111	109	108	106	105	103	.000961	.031
.045	.002025	121	120	118	117	116	114	113	111	109	108	.000916	.030
.044	.001936	126	125	124	123	121	120	118	116	114	113	.000876	.030
.043	.001849	132	131	130	129	127	125	124	122	120	118	.000841	.029
.042	001764	139	138	136	135	133	132	130	128	126	124	.000801	.028
.041	001681	140	146	143	142	140	138	136	134	132	130	.000762	.028
.040	.001600	153	152	151	149	147	145	143	141	139	137	000724	.027
.039	.001521	161	160	158	157	156	153	151	149	146	144	000692	.026
.038	.001444	170	169	167	165	163	161	159	157	154	152	.000655	.026
.037	.001369	180	178	176	174	172	170	168	165	163	160	.000620	.025
.036	.001296	190	188	186	184	182	180	178	175	172	169	000586	.024
.035	.001225	201	199	197	195	193	191	188	185	182	179	.000567	.024
.034	.001156	213	211	209	207	205	202	199	197	193	190	000524	.023
.033	.001089	227	225	223	220	218	215	212	209	206	202	000493	.022
.032	.001024	241	239	237	234	232	229	226	222	219	215	000462	.022
.031	.000961	257	255	253	250	247	244	241	237	233	229	000437	.021
.030	.000900	276	273	270	267	264	261	257	254	250	246	.000406	.020
.029	.000841	296	292	290	286	283	280	276	272	267	263	000380	.020
.028	.000784	317	314	311	308	304	300	296	292	287	282	000353	.019
.027	.000729	341	338	335	331	328	323	319	314	309	304	000331	.018
.026	.000676	369	365	362	358	354	349	345	340	334	328	.000308	.018
.025	.000625	399	396	392	388	383	379	373	368	362	356	.000282	.017
.024	.000576	434	430	426	422	417	411	406	400	394	387	.000259	.016
.023	.000529	474	469	465	460	455	449	443	436	429	422	000240	.016
.022	.000484	519	514	509	504	498	492	485	478	470	462	000219	.015
.021	.000441	571	566	560	554	548	541	533	526	517	508	000199	.014
.020	.000400	631	625	619	613	605	598	590	581	572	562	.000180	.013
.019	.000361	701	695	688	681	673	661	655	646	635	624	.000164	.013
.018	000324	783	776	769	761	752	742	732	721	710	698	.000148	.012
.017	.000289	881	873	865	856	846	835	824	812	799	785	.000130	.011
.016	000256	999	990	980	970	959	946	934	920	905	890	.000114	.011
.015	.000225	1141	1131	1120	1108	1095	1082	1067	1051	1034	1017	.000102	.010
.014	.000196	1319	1305	1292	1279	1264	1248	1231	1213	1193	1173	.000088	.009
.013	.000169	1536	1522	1507	1491	1474	1456	1436	1415	1392	1368	.000076	.009
.012	.000144	1814	1798	1781	1762	1742	1720	1696	1671	1645	1617	.000064	.008
.011	.000121	2176	2157	2137	2114	2089	2063	2035	2005	1973	1940	.000054	.007
.010	.000100	2659	2630	2610	2582	2552	2520	2486	2449	2411	2370	.000045	.007
.009	.000081	3321	3292	3260	3226	3188	3148	3105	3060	3011	2960	.000036	.006
.008	.000064	4266	4229	4188	4143	4095	4044	3989	3930	3868	3802	.000028	.005
.007	.000049	5680	5630	5570	5517	5453	5381	5311	5239	5159	5062	.000022	.005
.006	.000036	7933	7864	7798	7705	7610	7520	7416	7300	7193	7071	.000016	.004
.005	.000025	11851	11748	11634	11511	11377	11234	11081	10918	10745	10562	.000011	.003
.004	.000016	19501	19420	19232	19028	18808	18571	18318	18048	17763	17461	.000007	.003
.003	.000009	38400	38094	37600	37206	36864	36400	35904	35376	34810	34224	.000004	.002
.002	.000004	106666	105733	104711	103599	102399	101111	99733	98266	96711	95066	000002	.001
.001	.000001	960000	951600	942400	923400	921600	910000	897600	884400	870400	855600	.000000	.001
σ_p	σ^2_p	40–60%	39–61%	38–62%	37–63%	36–64%	35–65%	34–66%	33–67%	32–68%	31–69%	PE^2_p	PE_p

EDGERTON'S TABLE OF STANDARD ERRORS—Continued

σ_p	σ^1_p	30–70%	29–71%	28–72%	27–73%	26–74%	25–75%	24–76%	23–77%	22–78%	21–79%	PE^1_p	PE_p
.100	.010000											.004543	.067
.099	.009801											.004449	.067
.098	.009604											.004360	.066
.097	.009409											.004277	.065
.096	.009216											.004180	.065
.095	.009025											.004096	.064
.094	.008836											.004020	.063
.093	.008649											.003931	.063
.092	.008464	25										.003844	.062
.091	.008281	*	25									.003758	.061
.090	.008100	26	*	25								.003681	.061
.089	.007921	*	26	*	25							.003600	.060
.088	.007744	27	*	26	*	25						.003519	.059
.087	.007569	28	27	*	26	*	25					.003431	.059
.086	.007396	*	28	27	*	26	*					.003361	.058
.085	.007225	29	*	28	27	*	26	25				.003283	.057
.084	.007056	30	29	*	28	27	*	26	25			.003201	.057
.083	.006889	*	30	29	*	28	27	*	26	25		.003125	.056
.082	.006724	31	*	30	29	*	28	27	*	*		.003058	.055
.081	.006561	32	31	31	30	29	*	28	27	26	25	.002981	.055
.080	.006400	33	32	*	31	30	29	*	28	27	26	.002905	.054
.079	.006241	34	33	32	*	31	30	29	*	*	*	.002830	.053
.078	.006084	*	34	33	32	32	31	30	29	28	27	.002757	.053
.077	.005929	35	35	34	33	*	32	31	30	29	28	.002694	.052
.076	.005776	36	36	35	34	33	*	*	31	30	29	.002621	.051
.075	.005625	37	37	36	35	34	33	32	*	*	*	.002550	.051
.074	.005476	38	38	37	36	35	34	33	32	31	30	.002490	.050
.073	.005329	39	39	38	37	36	35	34	33	32	31	.002421	.049
.072	.005184	41	40	39	38	37	36	35	34	33	32	.002352	.049
.071	.005041	42	41	40	39	38	37	36	35	34	33	.002285	.048
.070	.004900	43	42	41	40	39	38	37	36	35	34	.002228	.047
.069	.004761	44	43	42	42	41	39	38	37	36	35	.002162	.047
.068	.004624	46	45	44	43	42	41	40	38	37	36	.002098	.046
.067	.004489	47	46	45	44	43	42	41	40	38	37	.002034	.045
.066	.004356	48	47	46	46	44	43	42	41	39	38	.001980	.045
.065	.004225	50	49	48	47	46	45	43	42	41	39	.001918	.044
.064	.004096	52	51	49	48	47	46	45	43	42	41	.001858	.043
.063	.003969	53	52	51	50	49	48	46	45	43	42	.001798	.042
.062	.003844	55	54	53	52	50	49	48	46	45	43	.001747	.042
.061	.003721	57	56	55	53	52	51	49	48	46	45	.001689	.041
.060	.003600	59	58	56	55	54	52	51	50	48	46	.001632	.040
.059	.003481	61	60	58	57	56	54	53	51	50	48	.001576	.040
.058	.003364	63	62	60	59	58	56	55	53	51	50	.001520	.039
.057	.003249	65	64	63	61	60	58	57	55	53	51	.001475	.038
.056	.003136	68	66	65	63	62	60	59	57	55	53	.001421	.038
.055	.003025	70	69	67	66	64	63	61	59	57	55	.001360	.037
.054	.002916	73	71	70	68	67	65	63	61	59	57	.001325	.036
.053	.002809	76	74	73	71	69	68	66	64	62	59	.001274	.036
.052	.002704	79	77	76	74	72	70	68	66	64	62	.001226	.035
.051	.002601	82	80	79	77	75	73	71	69	67	65	.001170	.034

EDGERTON'S TABLE OF STANDARD ERRORS—Continued

σ_p	σ^2_p	30–70%	29–71%	28–72%	27–73%	26–74%	25–75%	24–76%	23–77%	22–78%	21–79%	PE^2_p	PE_p
.050	.002500	85	84	82	80	78	76	74	72	70	67	.001136	.034
.049	.002401	89	87	85	83	81	79	77	75	72	70	.001089	.033
.048	.002304	93	91	89	87	85	83	80	78	76	73	.001043	.032
.047	.002209	97	95	93	91	88	86	84	81	79	76	.001005	.032
.046	.002116	101	99	97	95	92	90	88	85	82	80	.000961	.031
.045	.002025	106	103	101	99	97	94	92	89	86	83	.000918	.030
.044	.001936	110	108	106	104	101	99	96	93	90	87	.000876	.030
.043	.001849	116	113	111	109	106	103	100	98	95	91	.000841	.029
.042	.001764	121	119	117	114	111	108	105	102	99	96	.000801	.028
.041	.001681	128	125	122	120	117	114	111	107	104	101	.000762	.028
.040	.001600	134	131	129	126	123	120	116	113	109	106	.000724	.027
.039	.001521	141	138	136	132	129	126	123	119	115	111	.000692	.026
.038	.001444	149	146	143	140	136	133	129	125	122	117	.000655	.026
.037	.001369	157	154	151	147	144	140	136	132	128	124	.000620	.025
.036	.001296	166	163	159	156	152	148	144	140	136	131	.000586	.024
.035	.001225	176	172	169	165	161	157	153	148	144	139	.000557	.024
.034	.001156	187	183	179	175	171	167	162	157	152	147	.000524	.023
.033	.001089	198	194	190	186	182	177	172	167	162	157	.000493	.022
.032	.001024	211	207	203	198	193	188	183	178	172	167	.000462	.022
.031	.000961	225	221	216	211	206	201	196	190	184	178	.000437	.021
.030	.000900	241	236	231	226	221	215	209	203	197	190	.000408	.020
.029	.000841	258	253	248	242	236	230	224	218	211	204	.000389	.020
.028	.000784	277	272	266	260	254	247	241	234	226	219	.000353	.019
.027	.000729	299	293	287	280	273	266	259	252	244	236	.000331	.018
.026	.000676	322	316	310	303	295	288	280	272	263	255	.000306	.018
.025	.000625	349	343	335	328	320	312	303	295	285	276	.000282	.017
.024	.000576	380	372	365	356	348	339	330	320	310	300	.000259	.016
.023	.000529	414	409	398	389	380	370	360	349	338	327	.000240	.016
.022	.000484	454	445	436	426	416	405	394	383	371	358	.000219	.015
.021	.000441	499	489	479	469	457	446	434	421	408	394	.000199	.014
.020	.000400	552	541	530	518	505	493	479	465	451	436	.000180	.013
.019	.000361	613	601	589	575	562	547	532	517	501	484	.000164	.013
.018	.000324	685	672	658	643	628	612	596	578	560	541	.000146	.012
.017	.000289	771	756	740	723	706	688	669	650	630	609	.000130	.011
.016	.000256	874	857	839	822	800	780	759	737	714	690	.000114	.011
.015	.000225	998	976	958	937	915	891	867	842	816	789	.000102	.010
.014	.000196	1152	1126	1106	1081	1055	1028	1000	971	941	910	.000088	.009
.013	.000169	1341	1317	1290	1261	1231	1200	1167	1133	1098	1061	.000076	.009
.012	.000144	1587	1556	1524	1490	1454	1417	1379	1339	1297	1251	.000064	.008
.011	.000121	1904	1867	1828	1787	1745	1700	1654	1606	1556	1504	.000054	.007
.010	.000100	2326	2281	2233	2183	2131	2077	2021	1962	1901	1838	.000045	.007
.009	.000081	2906	2846	2790	2728	2662	2595	2524	2451	2375	2296	.000036	.006
.008	.000064	3733	3660	3583	3503	3420	3333	3242	3148	3050	2946	.000028	.005
.007	.000049	4970	4873	4771	4665	4553	4437	4317	4191	4061	3920	.000022	.005
.006	.000036	6912	6800	6664	6516	6360	6198	6020	5854	5672	5484	.000016	.004
.005	.000025	10370	10167	9955	9733	9501	9259	9007	8745	8471	8182	.000011	.003
.004	.000016	17142	16806	16457	16089	15703	15306	14880	14457	14008	13542	.000007	.003
.003	.000009	33600	32901	32256	31536	30784	30000	29184	28336	27456	26544	.000004	.002
.002	.000004	93333	91511	89500	87509	85511	83333	81066	78711	76266	73733	.000002	.001
.001	.000001	840000	823600	806400	788400	768000	750000	729600	708400	686400	663600	.000000	.001
σ_p	σ^2_p	30–70%	29–71%	28–72%	27–73%	26–74%	25–75%	24–76%	23–77%	22–78%	21–79%	PE^2_p	PE_p

EDGERTON'S TABLE OF STANDARD ERRORS—Continued

σ_p	σ^2_p	20–80%	19–81%	18–82%	17–83%	16–84%	15–85%	14–86%	13–87%	12–88%	11–89%	PE^2_p	PE_p
.100	.010000											.004543	.067
.099	.009801											.004449	.067
.098	.009604											.004360	.066
.097	.009409											.004277	.065
.096	.009216											.004186	.065
.095	.009025											.004096	.064
.094	.008836											.004020	.063
.093	.008649											.003931	.063
.092	.008464											.003844	.062
.091	.008281											.003758	.061
.090	.008100											.003684	.061
.089	.007921											.003600	.060
.088	.007744											.003510	.059
.087	.007569											.003434	.059
.086	.007396											.003364	.058
.085	.007225											.003283	.057
.084	.007056											.003204	.057
.083	.006889											.003125	.056
.082	.006724											.003058	.055
.081	.006561											.002981	.055
.080	.006400	25										.002905	.054
.079	.006241	*										.002839	.053
.078	.006084	26	25									.002767	.053
.077	.005929	27	26	25								.002694	.052
.076	.005776	28	*	*								.002621	.051
.075	.005625	*	27	26	25							.002550	.051
.074	.005476	29	28	27	26							.002490	.050
.073	.005329	30	29	28	*	25						.002421	.049
.072	.005184	31	30	*	27	26						.002352	.049
.071	.005041	32	*	29	28	27	25					.002285	.048
.070	.004900	33	31	30	29	*	26					.002228	.047
.069	.004761	34	32	31	30	28	27	25				.002162	.047
.068	.004624	35	33	32	*	29	*	26				.002098	.046
.067	.004489	36	34	33	31	30	28	27	25			.002034	.045
.066	.004356	37	35	34	32	31	29	28	26			.001980	.045
.065	.004225	38	36	35	33	32	30	*	27	25		.001918	.044
.064	.004096	39	38	36	34	33	31	29	28	26		.001858	.043
.063	.003969	40	39	37	36	34	32	30	*	27	25	.001798	.042
.062	.003844	42	40	39	37	35	33	31	29	*	*	.001747	.042
.061	.003721	43	42	40	38	36	34	32	30	28	26	.001689	.041
.060	.003600	45	43	41	39	37	36	34	31	29	27	.001632	.040
.059	.003481	46	44	43	41	39	37	35	33	30	28	.001576	.040
.058	.003364	48	46	44	42	40	38	36	34	31	29	.001529	.039
.057	.003249	50	48	46	44	42	39	37	35	33	30	.001475	.038
.056	.003136	51	49	47	45	43	41	39	36	34	31	.001421	.038
.055	.003025	53	51	49	47	45	42	40	38	35	32	.001370	.037
.054	.002916	55	53	51	49	46	44	42	39	36	34	.001325	.036
.053	.002809	58	55	53	51	48	46	43	41	38	35	.001274	.036
.052	.002704	60	58	55	53	50	48	45	42	39	36	.001225	.035
.051	.002601	62	60	57	55	52	49	47	44	41	38	.001179	.034

EDGERTON'S TABLE OF STANDARD ERRORS—Continued

σ_p	σ_p^2	20–80%	19–81%	18–82%	17–83%	16–84%	15–85%	14–86%	13–87%	12–88%	11–89%	PE^2_p	PE_p
.050	.002500	65	62	60	57	54	52	49	46	43	39	.001136	.034
.049	.002401	68	65	62	59	57	54	51	48	44	41	.001080	.033
.048	.002304	70	68	65	62	59	56	53	50	46	43	.001043	.032
.047	.002209	73	71	68	65	62	58	55	52	48	45	.001005	.031
.046	.002116	77	74	71	68	64	61	58	54	51	47	.000961	.031
.045	.002025	80	77	74	71	67	64	60	57	53	49	.000918	.030
.044	.001936	84	81	78	74	71	67	63	59	55	51	.000876	.030
.043	.001849	88	85	81	78	74	70	66	62	58	54	.000841	.029
.042	.001764	92	89	85	81	78	74	69	65	61	56	.000801	.028
.041	.001681	97	93	89	86	81	77	73	68	64	59	.000762	.028
.040	.001600	102	98	94	90	86	81	77	72	67	62	.000724	.027
.039	.001521	107	103	99	95	90	86	81	76	71	66	.000692	.026
.038	.001444	113	109	104	100	95	90	85	80	75	69	.000655	.026
.037	.001369	120	115	110	105	100	95	90	84	79	73	.000620	.025
.036	.001296	126	122	117	111	106	101	95	89	83	77	.000586	.024
.035	.001225	134	129	124	118	112	107	101	95	88	82	.000557	.024
.034	.001156	142	137	131	125	119	113	107	100	94	87	.000524	.023
.033	.001089	151	145	139	133	127	120	113	107	99	92	.000493	.022
.032	.001024	161	155	148	142	135	128	121	113	106	98	.000463	.022
.031	.000961	171	165	158	151	144	137	129	121	113	105	.000437	.021
.030	.000900	183	176	169	162	154	146	138	129	121	112	.000408	.020
.029	.000841	196	189	181	173	165	156	148	139	130	120	.000380	.020
.028	.000784	211	203	195	186	177	168	159	149	139	129	.000353	.019
.027	.000729	227	219	210	200	191	181	171	161	150	139	.000331	.018
.026	.000676	246	236	226	216	206	196	185	173	162	150	.000306	.018
.025	.000625	266	256	245	235	223	212	200	188	175	163	.000282	.017
.024	.000576	289	278	267	255	243	230	218	204	191	177	.000260	.016
.023	.000529	316	303	291	278	265	251	237	223	208	193	.000240	.016
.022	.000484	346	332	319	305	290	275	260	244	228	211	.000219	.015
.021	.000441	380	366	351	335	319	303	286	269	251	232	.000199	.014
.020	.000400	420	404	388	371	353	335	316	297	277	257	.000180	.013
.019	.000361	467	449	431	412	392	372	351	330	308	286	.000164	.013
.018	.000324	522	502	481	460	438	416	393	369	344	319	.000146	.012
.017	.000289	587	565	542	518	493	468	442	415	387	359	.000130	.011
.016	.000256	665	640	614	587	559	530	501	470	439	407	.000114	.011
.015	.000225	760	731	702	671	639	606	572	537	502	465	.000102	.010
.014	.000196	877	844	809	774	737	699	660	620	579	537	.000088	.009
.013	.000169	1024	984	944	903	860	816	770	723	675	626	.000076	.009
.012	.000144	1209	1163	1116	1066	1016	964	910	855	798	740	.000064	.008
.011	.000121	1451	1395	1338	1279	1219	1156	1092	1025	957	887	.000054	.007
.010	.000100	1772	1705	1635	1563	1489	1412	1334	1253	1170	1084	.000045	.007
.009	.000081	2214	2130	2042	1952	1860	1764	1666	1565	1461	1355	.000036	.006
.008	.000064	2844	2735	2623	2508	2389	2266	2140	2010	1877	1740	.000029	.005
.007	.000049	3786	3642	3493	3339	3181	3017	2849	2676	2499	2317	.000022	.005
.006	.000036	5289	5087	4879	4664	4442	4214	3980	3738	3490	3236	.000016	.004
.005	.000025	7901	7600	7288	6967	6637	6296	5945	5585	5214	4834	.000011	.003
.004	.000016	13061	12563	12048	11518	10971	10408	9828	9232	8620	7991	.000007	.003
.003	.000009	25600	24624	23616	22576	21504	20400	19264	18096	16896	15664	.000004	.002
.002	.000004	71111	68400	65600	62711	59733	56666	53511	50266	46933	43511	.000002	.001
.001	.000001	640000	615600	590400	564400	537600	510000	481600	452400	422400	391600	.000000	.001
σ_p	σ^2_p	20–80%	19–81%	18–82%	17–83%	16–84%	15–85%	14–86%	13–87%	12–88%	11–89%	PE^2_p	PE_p

EDGERTON'S TABLE OF STANDARD ERRORS—Continued

σ_p	σ^2_p	10–90%	9–91%	8–92%	7–93%	6–94%	5–95%	4–96%	3–97%	2–98%	1–99%	PE^2_p	PE_p
.100	.010000											.004549	.067
.099	.009801											.004449	.067
.098	.009604											.004369	.066
.097	.009409											.004277	.065
.096	.009126											.004186	.065
.095	.009025											.004106	.064
.094	.008836											.004020	.063
.093	.008649											.003931	.063
.092	.008464											.003844	.062
.091	.008281											.003768	.061
.090	.008100											.003684	.061
.089	.007921											.003604	.060
.088	.007744											.003516	.059
.087	.007569											.003434	.059
.086	.007396											.003361	.058
.085	.007225											.003283	.057
.084	.007056											.003204	.057
.083	.006889											.003125	.056
.082	.006724											.003058	.055
.081	.006561											.002981	.055
.080	.006400											.002905	.054
.079	.006241											.002830	.053
.078	.006084											.002767	.053
.077	.005929											.002694	.052
.076	.005776											.002621	.051
.075	.005625											.002550	.051
.074	.005476											.002490	.050
.073	.005329											.002421	.049
.072	.005184											.002352	.049
.071	.005041											.002285	.048
.070	.004900											.002228	.047
.069	.004761											.002162	.047
.068	.004624											.002098	.046
.067	.004489											.002034	.045
.066	.004356											.001980	.045
.065	.004225											.001918	.044
.064	.004096											.001858	.043
.063	.003969											.001798	.042
.062	.003844											.001747	.042
.061	.003721											.001690	.041
.060	.003600	25										.001632	.040
.059	.003481	26										.001576	.040
.058	.003364	27										.001520	.039
.057	.003249	28	25									.001475	.038
.056	.003136	29	26									.001421	.038
.055	.003025	30	27									.001369	.037
.054	.002916	31	28	25								.001325	.036
.053	.002809	32	29	26								.001274	.036
.052	.002704	33	30	27								.001225	.035
.051	.002601	35	32	28	25							.001176	.034

Edgerton's Table of Standard Errors—*Concluded*

σ_p	σ^1_p	10–90%	9–91%	8–92%	7–93%	6–94%	5–95%	4–96%	3–97%	2–98%	1–99%	PE'_p	PE_p
.050	.002500	36	33	30	26							.001136	.034
.049	.002401	38	34	31	27							.001089	.033
.048	.002304	39	36	32	29							.001013	.032
.047	002209	41	37	34	30	26						.001005	.032
.046	.002116	43	39	35	31	27						.000961	.031
.045	.002025	45	41	37	32	28						.000918	.030
.044	001936	47	43	38	34	29	25					.000870	.030
.043	001849	49	45	40	36	31	26					.000841	.029
.042	001764	52	47	42	37	32	27					000801	.028
.041	.001681	54	49	44	39	34	28					.000762	.028
.040	.001600	57	52	47	41	36	30					.000724	.027
.039	001521	60	55	49	43	38	32	25				.000692	.026
.038	001444	63	58	52	46	40	33	27				000655	.026
.037	.001369	67	61	55	48	42	35	29				.000620	.025
.036	001296	71	64	58	51	44	37	30				000588	.024
.035	.001225	75	68	61	54	47	39	32				000557	.024
.034	.001156	80	72	65	58	50	42	33	25			.000524	.023
.033	.001089	85	77	69	61	53	44	36	27			.000493	.022
.032	.001024	90	82	74	65	56	47	38	29			000462	.022
.031	.000961	96	88	79	69	60	51	40	31			000437	.021
.030	.000900	103	94	84	74	64	54	43	33			.000408	.020
.029	.000841	110	100	90	80	69	58	46	35			.000380	.020
.028	000784	119	108	97	86	74	62	50	38	26		.000353	.019
.027	000729	128	116	104	92	80	67	54	41	27		000331	.018
.026	.000676	138	125	113	100	86	73	58	44	30		.000306	.018
.025	.000625	149	136	122	108	93	79	63	48	32		000282	.017
.024	.000576	162	148	133	117	102	86	68	52	35		.000259	.016
.023	.000529	177	161	146	128	111	93	75	57	38		.000240	.016
.022	.000484	194	177	159	140	122	102	82	62	42		000219	.015
.021	.000441	214	194	175	154	134	113	90	69	46		.000199	.014
.020	.000400	236	215	193	171	148	124	100	76	51	26	.000180	.013
.019	*.000361*	*262*	*239*	*215*	*190*	*164*	*138*	*111*	*85*	*57*	*28*	*.000164*	.013
.018	.000324	293	267	240	212	184	155	124	95	63	32	.000146	.012
.017	.000289	330	300	270	239	207	174	139	106	71	36	000130	.011
.016	.000256	374	340	306	270	234	197	158	121	81	41	.000114	.011
.015	.000225	428	389	350	309	268	225	181	138	93	47	000102	.010
.014	.000196	493	446	403	357	309	260	209	159	107	54	000088	.009
.013	.000169	576	524	471	416	360	304	243	186	125	63	000076	.009
.012	.000144	686	619	556	492	426	359	288	220	148	74	.000061	.008
.011	.000121	816	742	667	590	511	430	346	263	177	89	000054	.007
.010	000100	997	907	815	721	621	520	422	322	217	109	000045	.007
.009	000081	1215	1133	1018	901	780	657	527	402	271	137	000036	.006
.008	.000064	1509	1155	1309	1157	1002	814	677	517	348	175	.000028	.005
.007	.000049	2130	1938	1742	1540	1334	1124	901	698	463	234	.000022	.005
.006	.000036	2975	2707	2433	2152	1864	1570	1259	961	647	327	.000016	.004
.005	.000025	4444	4044	3634	3214	2785	2346	1881	1437	967	488	000011	.003
.004	.000016	7316	6685	6008	5314	4601	3877	3110	2376	1599	808	000007	.003
.003	.000009	14400	13104	11778	10416	9021	7600	6096	4656	3130	1584	000004	.002
.002	*.000004*	*39999*	*30399*	*32711*	28033	25288	21111	16933	12933	8711	4399	000002	.001
.001	.000001	300000	327600	294400	260100	225000	190000	152400	116400	78100	39600	000000	.001
σ_p	σ^1_p	10–90%	9–91%	8–92%	7–93%	6–94%	5–95%	4–96%	3–97%	2–98%	1–99%	PE'_p	PE_p

USE OF THE TABLE

Problem: To determine the σ_p, σ_p^2, PE_p and PE^2_p in the case where 17 out of 34 cases reacted in a certain way. The percentage is 50 per cent and the number of cases is 34. Look at the first entry in the horizontal row at the top of the table, i.e., 50–50 per cent. Then look down the column under that entry until 34, the number of cases, is found. (In case the exact n is not given in the table, use the n next higher). Then reading to the left the σ_p value is found to be 0.086, and its square to be 0.007396. In the last column reading to the right is found a PE_p value of 0.058 and a PE^2_p value of 0.003364. Expressing these values in percentages rather than in decimals the following statement may be made. The standard error of 50 per cent, where the number of cases is 34, is 8.6 per cent, the square of the standard error is 65.61 per cent, the probable error is 5.8 per cent and the square of the probable error is 33.64 per cent. These values can then be used in determining the statistical significance of the difference between this percentage based on 34 cases and any other percentage based on any number of cases.

Problem: To determine the significance of the difference between two percentages (p_1 and p_2) the first showing 50 per cent of a group of 34 reacting in a certain way and the second showing 42 per cent of a group of 73 cases reacting in the same way. We have our σ_p and $\sigma_{p_1}^2$ values for the first group as shown above (i.e., 0.086 and 0.007396). The σ_p^2 value for the second group is obtained by looking across the top of the table to the ninth column (42–58%), looking down that column and locating 73 (the number of cases), and then looking across to the left to the first column and finding the σ_p^2 which is 0.058, its square being 0.003364.

The formula[3] for determining the standard error of the difference is:

$$\sigma_{\text{diff.}} = \sqrt{\sigma_{p_1}^2 + \sigma_{p_2}^2}$$

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[3] G. U. Yule: An Introduction to the Theory of Statistics, 1924, p. 260, formula (6).

Substituting our obtained values in the above formula we have:

$$\sigma_{\text{diff.}} = \sqrt{0.007300 + 0.003304} = \sqrt{0.010760} = 0.103$$

This value of 0.103 can then be related to the difference which was 0.080, to show the ratio of the obtained difference to the standard error of the difference. In this case the difference is found not to be statistically significant since it is smaller than the standard error of the difference.

It is obvious that if the formula for the probable error of the difference, i.e., $PE_{\text{diff.}} = \sqrt{PE^2_{p_1} + PE^2_{p_2}}$, is used one need only refer to the last two columns of the table and substitute these PE_p values in a similar manner.

A CORRECTION

Attention of subscribers and readers of the JOURNAL OF APPLIED PSYCHOLOGY is called to a regrettable and serious error made in the September issue for 1925, page 222. In order to correct this we are reprinting Table 1 of the article by Miss Constance T. Dowd and Dr. Ada Hart Arlitt on "Relative Effects of Play and Gymnastics."

TABLE 1

*Difference in average gains of experimental and control groups**

	AVERAGE GAIN		DIFFERENCE	P.E.	DIFFERENCE IN P.E. UNITS
	Formal Gymnastic Group	Supervised Play Group			
Cancellation	7.88	8.05	−0.17	1.27	−0.14
Card Sorting	4.50	4.79	−0.29	1.42	−0.20
Tapping, right	9.33	8.06	1.27	3.24	0.39
Tapping, left	1.22	6.16	−4.94	3.99	−1.24
Weight Lifting	−0.03	0.23	−0.26	2.72	−0.97
Balance Line	0.05	1.35	−1.30	0.77	−1.68
Bean Bags	−3.22	−7.29	4.07	1.86	2.18
Hopping	0.61	0.41	0.20	0.72	0.28
Target	2.94	3.05	−0.11	1.20	−0.09
Vital Capacity	4.11	2.41	1.70	2.21	0.77
Hand Grip, right	2.89	5.47	−2.58	1.76	−1.46
Hand Grip, left	0.61	2.41	−1.80	1.37	−1.31
Baseball Throw	−63.88	11.02	−74.90	40.46	−1.85
Basket Ball Throw	−0.11	10.76	−22.87	15.36	−1.49
Dash	0.00	0.08	−0.08	0.13	−0.61
Hop, Step and Jump	17.50	10.26	7.24	4.65	1.55
High Jump	3.94	3.35	0.59	0.77	0.76
Running Broad Jump	20.66	22.94	−2.28	2.40	−0.91
Standing Broad Jump	2.61	1.76	0.85	1.04	0.81

NOTES AND NEWS

Dr. Gordon W. Allport (Harvard) has been appointed Assistant Professor of Psychology in Dartmouth College.

Prof. Mark May who has been on leave for research on character testing at Columbia will return to Syracuse University in the fall of 1927 to engage in research work on personnel problems and administration.

Prof. F. H. Allport of Syracuse University reports survey of student opinion upon 75 items of college life. Results are now being compiled from 4250 cases. The reaction scale in form and content is largely psychological. Results promise some application to political psychology. Scales for measuring personality traits are being devised by Profs. G. W. and F. H. Allport.

Director Emily Burr, Vocational Adjustment Bureau, 336 E. 19th Street, New York, reports personnel as follows: Alice Bessey and Mona Jacobs, Placement Counselors; Katherine Treat, Research Worker; Edna Unger, Industrial Expert; Ella Doux, Director of Workshop for Neurotic and Psychopathic Girls. An "Industrial Calendar" is the result of the most recent research.

Prof. William M. Brown, Washington & Lee University, Lexington, Va., is serving as Psychological Examiner and Vocational Advisor and is also head of the Department of Psychology. Walter A. Flick is Assistant Professor of Psychology.

Dr. Elsie O. Bregman of the Psychological Corporation will publish shortly a comparative study of character traits in women secretaries, chemists, lawyers, statisticians and department store workers for the Bureau of Vocational Information, N. Y.

Prof. Mary Stuart, Psychology, Durham University, England, delivered two lectures to the Summer School students, University of Colorado.

Prof. L. W. Cole, University of Colorado, is the author of a new text book, "Factors of Human Psychology," already adopted by several colleges.

Dr. George Van Ness Dearborn, Director, laboratory of Medical Psychology, United States Veterans' Hospital, Kingsbridge, N. Y., recently read a paper before the American Psychiatric Association on a new method for determining intellectual regression in the psychotic and psychoneurotic as an aid to diagnosis and prognosis. It is reported that this is the only laboratory of its kind in the Veterans' Bureau.

Dr. S. I. Franz, University of California, Southern Branch, reports the promotion of Dr. Ellen B. Sullivan to the rank of assistant professor.

Dr. Thomas R. Garth is director of three expeditions to the Indian reservations, Rosebud, Pine Ridge and Chilocco, made for the purpose of studying intelligence, school achievement and musical talent. Mexicans of New Mexico have been tested in the same ways.

Gladys M. Love has resigned from the Judge Baker Foundation, Boston, to become school psychologist, Montclair, N. J.

The staff of this Foundation will soon publish a Manual of Mental Tests which will include many thorough standardizations made possible by extensive coöperation.

Dr. W. A. Brownell, formerly of the University of Illinois, has been appointed Assistant Professor, University Division of Education, Cornell University. He will give courses in Psychology to students of hotel administration and do research in hotel personnel.

Dr. G. H. Miles, Assistant Director of the National Institute of Industrial Psychology, London, is lecturing this summer at Columbia University on Industrial Psychology in England. Dr. Mary H. S. Hayes, Director of the Vocational Service for Juniors, New York, is conducting a course in Columbia on the Technique of Counselling and Placement.

Dr. Carney Landis for two years National Research Fellow in the Biological Sciences (Psychology) has been appointed Assistant Professor of Psychology, Wesleyan University, Conn. During the present summer he has been investigating skin resistance during sleep for the Simmons Fellowship at Mellon Institute for Industrial Research, University of Pittsburgh.

Prof. Franklin Fearing, Stanford, has been appointed Associate Professor of Psychology, Ohio Wesleyan University. Prof. Kate Gordon, University of California, Southern Branch, was lecturer at Stanford University during the summer quarter.

The Western Psychological Association met at Mills College, June 18-19, 1926. Prof. Kate Gordon was elected president.

"Mental Training for the Pre-School Age Child" by Lillien J. Martin and Clair de Gruchy has reached its second edition.

The Catholic University of America, Washington, D. C., announces the publication of a new series of Monographs by Williams & Wilkins Co., Baltimore, Md. The new studies in Psychology and Psychiatry, No. 1, "Psychology of Reasoning, " by Miriam F. Dunn; No. 2, "Diastatic Activity of the Blood Serum in Mental Disorders," by John W. Rauth.

Dr. Deane B. Judd, Cornell, is now Munsell Research Associate in Colorimetry at the National Bureau of Standards. Prof. E. P. T. Tyndall is engaged during this summer at the National Bureau of Standards in a study of hue sensibility as a function of saturation. The Munsell Research Laboratory, Baltimore, is coöperating with the Bureau of Standards in an investigation of hue sensibility, chromo sensibility and colorimetric standards.

Prof. Karl G. Miller, Psychology, University of Pennsylvania, has been appointed Director of Admissions; also Dr. Robert A. Brotemarkle has been appointed Personnel Officer.

Prof. Edward S. Robinson, Associate Professor of Psychology, University of Chicago, will serve at Yale in the same capacity during the first semester and at Harvard as Lecturer on Psychology during the second semester of next year.

Dr. G. M. Ruch, Associate Professor of Psychology and Education, University of Iowa, has accepted a professorship of Educational Psychology, University of California. He is giving courses during the present summer in Educational Psychology at Chicago.

Chiefly through the energy of Dr. Morton Prince, approximately one hundred thousand dollars for instruction and research in abnormal and dynamic psychology has been received by Harvard University. For the year 1926-27 he has been appointed Associate Professor of Abnormal and Dynamic Psychology. His task will be to organize this new work in order to bring about fundamental scientific research in abnormal psychology and in personality, without any necessary relation to therapeutics or other practical applications.

The Child Clinic, Los Angeles, Calif., will have personnel as follows: E. Van Norman Emery, Director; Julia Mathews, Psychologist; Edith M. Burleigh, Chief of Social Service; Esther Heath, Marjorie Stauffer and Florence Gary, Psychiatric Social Workers.

Dr. A. H. Sutherland, since 1917 Director of Research and Psychologist for the Los Angeles Public Schools, becomes Director of the Scarborough Schools, Scarborough, N. Y., founded and supported by Frank A. Vanderlip. While at Los Angeles Dr. Sutherland built up a department probably larger than any other similar department in this country. At Scarborough he will gradually introduce the methods and organization of work for normal and super-bright children which have attracted such favorable attention in Los Angeles. For years he has demonstrated that children cannot only on the average progress faster but perhaps even raise their IQ's by specially directed exercises.

The School of Education, New York University, announces as full-time personnel Drs. Benson, Skinner, West and Daisy Hetherington, the first-named being chairman. For part-time, Drs. Meta Anderson, Alice Von Bauer, and J. C. Bell.

Skidmore College announces that Intelligence, Emotional and Vocational Tests are given to all students.

Dean Seashore, Graduate College, Iowa, announces that Dr. Oliver A. Ohmann, instructor in Business Psychology for the past two years has accepted an appointment at Western Reserve University. Dr. George Gallop (Iowa) will offer courses in the Psychology of Advertising and Personnel. Dr. Samuel T. Orton has almost ready a new unit for the investigation of reading disabilities of great theoretical and practical significance.

The Research Bureau, State Board of Control, St. Paul, Minn., reports the appointment of Miss Gertrude Tartar formerly in charge of Psychological Clinic at the U. S. Veterans' Hospital, Wakashau, Wis., as Mental Examiner of Research Bureau. Miss Charlotte Lowe, Mental Examiner, has completed an investigation of the intelligence and social background of unmarried mothers.

During the summer quarter the University of Southern California had as additional staff members Drs. Guy M. Whipple, Detroit, and John J. B. Morgan, Northwestern University.

Dr. Eleanor Rowland Wembridge, Psychologist of the Women's Protective Association of Cleveland, has been appointed Referee of the Juvenile Court of that city.

The Iowa Child Welfare Research Station of the University of Iowa is extending its facilities and resources for research in the field of child development. Five divisions of pre-school laboratories were conducted during the past year with ninety infants and young children in daily attendance. During the fall and winter sessions special graduate and post doctorate seminars and research courses will be given in physical growth, nutrition of the child, psychology of childhood, preschool teaching, and parent education.

Within the past year five doctor's dissertations have been completed and published in the field of the psychology of the young child.

The Research Station in Character Education, University of Iowa, Iowa City, Dr. Edwin D. Starbuck in charge, invites correspondence concerning its achievements in intensive studies of methods of Character Education. The Bureau of Education of New York City after three years of careful study pays this tribute to the "Iowa Plan:" "It should be read and studied by every teacher and principal who would have a thorough understanding of this question."

The International Sunshine Department for Blind Babies and Backward Blind Children, 96 Fifth Avenue, N. Y., requests that it be informed by any one who knows of blind and backward young children. To date only four states pay $1.50 per day for the care and education of such unfortunates.

AMERICAN ASSOCIATION OF PSYCHIATRIC SOCIAL WORKERS

The Section on Psychiatric Social Work of the American Association of Hospital Social Workers formally disbanded at its fourth annual meeting held at Cleveland on May 26, 1926, and a new independent organization, the American Association of Psychiatric Social Workers, was formed. The new Association realizes that it has been of inestimable value during the period of initial growth to have been affiliated with the larger, well-established professional group of hospital social workers, and does not expect that the separation will lessen the coöperation between the two bodies.

At the general session that followed, the subject "Some Recent Experiments among Psychiatric Social Workers" was presented by five Section members who have undertaken work in new fields. The studies reported, the discussions and the recommendations in the president's annual address are certain to be of interest to students of Applied Psychology.

The officers of the new Association are: Mrs. Maida H. Solomon, Boston Psychopathic Hospital, President; Miss Kathleen Ormsby, National Committee for Mental Hygiene, New York City, Secretary-Treasurer.

RESEARCH ON SLEEP

In 1924 the Simmons Fellowship was founded at Mellon Institute of Industrial Research, University of Pittsburgh, to carry on a broad study of problems in the promotion and maintenance of healthful sleep. Dr. H. M. Johnson and Mr. G. E. Weigand, psychologists, and Dr. T. H. Swan, physical chemist, have been conducting this research during the past year. Recently Dr. Carney Landis, physiologist, has temporarily joined the personnel of the investigation. It is announced that from now on there will be two separate Simmons Fellowships at Mellon Institute. One of them will continue the research on the physiological and psychological factors of sleep under the supervision of Dr. Johnson. The other Fellowship, held by Dr. Swan, will be concerned chiefly with the subject of bedding materials. This investigational work is being supported primarily for the benefit of the public and consequently the experimental results will be published.

BOOK REVIEWS

PAUL C. SQUIRES. *A Universal Scale of Individual Performance Tests.* Examination Manual. Princeton University Press, 1926. Pp. 158.

This volume constitutes Part One of a monograph that reports a project undertaken by the writer at Princeton University during the years 1923 to 1925 under an appropriation made by the Committee on Scientific Problems of Human Migration, of the National Research Council. Work on this problem was carried on under the direction of Professor Carl C. Brigham. Part Two of the monograph is to be devoted to the discussion of the results obtained by the application of the scale.

The writer states that he has attempted to construct a scale of individual performance tests that will completely dispense with the use of language, that will differentiate within the upper as well as within the lower ranges of intelligence, and that may be applied to any individual whatever, irrespective of race, nationality or culture. To what extent he has succeeded in this attempt it is impossible even to hazard a guess until the data obtained by the use of the scale are available.

There are fourteen tests, described in detail in the following order:

1. Series Forward Test
2. Single Cube-piles test
3. Association Test (Pictorial)
4. Association Test (Quantitative)
5. Arrangement of Cube-piles Test
6. Painted Cube Test
7. Series Reversed Test
8. Association Test (Geometric)
9. Block Construction Test
10. Picture Analysis Test
11. Reasoning Test
12. Free Analogies Test (Pictorial)
13. Spot Pattern Test
14. Right and Left Hands Test

Although much of this material was suggested by the work of earlier investigators, the tests in their present form will probably constitute a valuable addition to the stock of performance tests available for the testing of intelligence. The time required to give the complete scale averages about three hours and a quarter. This, together with the somewhat elaborate apparatus and procedure may tend to limit the use of the scale in its present form.

Creative work is slow and difficult. There are many false moves. Much effort is apparently wasted. It is only when we are completing a project that we can see how to begin it. Although, without any data at hand, it is impossible to evaluate the work reported in this monograph, the reviewer has the impression that an excellent piece of preparatory work has been accomplished, and that the writer is now in a position to attack the problem of constructing and standardizing a scale of individual performance tests that will satisfy practical requirements as to time and simplicity, without sacrificing any of the advantages of the scale in its present form.

GRACE ARTHUR,
Child Guidance Clinic, St. Paul, Minnesota.

HARRY HELSON. *The Psychology of Gestalt.* Published by the Author, Urbana, Ill., 1926. Pp. 131. $1.50.

This monograph comprises the author's four papers on Gestalttheorie which appeared originally in the American Journal of Psychology, vols. 36-37. They represent the substance of Helson's dissertation, completed at Harvard in 1924. The first three papers deal with the problem, method and some experimental results abstracted from the works of the leading exponents of the theory. In the last paper Helson presents his own opinions in a critical review of the principles of Gestalt. The pagination of the reprinted papers is retained in the monograph.

The reviewer is convinced that this monograph is deserving of a wide and critical reading, particularly by those who are now struggling in the winter of their psychological discontent with both traditional and current systems. Helson's papers present the best exposition to date in the English, doubtless, of the *Standpunkte* of the Gestaltists. However it is questionable whether there is as general agreement among the exponents of this view as the reader is likely to infer—particularly where fundamental issues are involved. Aside from the Graz school, there are serious differences in the systems of Wertheimer, Köhler and Koffka which are evident in their original papers, more so than in Helson's monograph.

In addition to his exposition of Gestalt the author is impelled to express his dissatisfaction, in almost every section of the monograph, with the systems which he designates as associationism, introspectionism and behaviorism. His attempts to castigate "the behaviorist" are weak and inaccurate and seem to be based on nothing but a displeasure with Watsonian doctrines of 1919 and earlier. He charges "the behaviorist," "if there are any thoroughgoing behaviorists left

(p. 350)," with the same Robackian offenses as of old, namely, "dogmatism" (p. 197), "throwing the baby out with the bathwater" (p. 02), making Thorndike a behaviorist (p. 349), "attempts to reduce *meaningful* responses to unit (meaningless) reflexes" (p. 195) and that the "selection" in the "learning" of skillful acts is by "blind chance" and "stark mechanism" (pp. 44 et seq., 62).

The net result of this Quixotic foray detracts from and is irrelevant to the otherwise positive assertions in behalf of the Gestalt attempt to get a monistic science, in which there are no breaks between the artificial divisions which we call, academically, physics, physiology, neurology, etc., and yet (for psychology at least) to avoid giving up the mentalistic ghost by calling it by such terms as "phenomenal fields," "experimental data" and the like (pp. 514-516).

The problem of Gestalt psychology as Helson envisages it is "to steer between the blind mechanism of the frequency and conditioned reflex theories and the vitalism of Bergson, Driesch and others" (p. 44). Factually this is not *problem* at all, but an aspect of method. We read that "the aim of the configurationists . . . . has been to account for phenomenal patterns by means of configurational processes in the nervous system without any break in theory" (p. 515) and that "the configuration in its broadest sense . . . . means no more and no less than the totality of conditions both outside and inside the organism" (p. 505). Also that "the past, present and *future needs* (Italics mine) of the organism combine to modify every single act in the economy of the whole" (p. 42) and that "the end is the controlling factor in everything the ape does" (p. 45). This sounds like pure teleology. There is no hint, in the monograph, as to how *future* needs (i.e., stimulating conditions) can excite *present* receptors.

On p. 48 we read that "if an animal cannot survey the whole situation in which his problem is enmeshed, the result will be a chance performance and a smooth learning curve." This is not clear; particularly the words "chance" and "smooth."

On p. 197 Helson states that "the configuration rests upon the usual view of (relatively) independent systems." Köhler has repeatedly emphasized the fact that Gestalten are "differential *dependencies* in equilibrium distributions of wider area." Again on p. 192 "in so far as they (Gestaltists) reject *all* analysis . . . . I must part company with them." The quarrel is not with analysis *per se*, in any of the five types enumerated by Köhler, nor in the use of any or all of these in the search for "real units" but in the abusive laxity which makes the analytic derivatives *malapropos*. It is the "reification" of the products which is at fault.

The treatment of the principles of "closure," the "copy" theory, the *transponierbarkeit* of Gestalten, "insight," the processes of *Nivel-*

lierung, *Prägnanz*, pure phi, and "learning" deserve an extended consideration which space forbids here. This adds weight to the advice to the reader of this review to read carefully Dr. Helson's well written monograph. Its faults are small compared to its contribution. While Gestalt psychology doubtless has much of value for American Psychology yet the rule of *caveat lector* is a good one to follow. Gestalt phenomenology is not psychology. The merits or defects of the system will "come out in the wash" of future experimentation.

SAMUEL RENSHAW,
Ohio State University.

ARTHUR JORDAN BREWSTER. *Introduction to Retail Advertising*. A. W. Shaw Company, 1926. 310 pp.

The author states that he has endeavored to write a book that will be helpful to retailers and serve as a textbook in schools and colleges, the former purpose being the more fundamental one. He begins with a general survey of the field of retailing. A very readable and interesting discussion of some of the newer problems of the retailer, due to changing conditions in present-day life, forms a part of this survey.

The treatment of copy-writing may be characterized as direct, clear and practical. That advertising should grow out of merchandising and store activities is the thesis upon which the principles of copy-writing are based. Type, layout, and illustration are handled in a manner designed to meet the needs of the small advertiser who has had little experience in getting advertising material ready for the printer. Type faces and measurement, printing processes, how to lay out an advertisement, and the more important processes used in reproducing illustrations are included in this division of the book. Following sections deal with the various advertising media and the adaptation of advertising to special forms of retailing. The concluding division is devoted to coöperation presenting such subjects as helps from manufacturers, coöperative retail advertising, and the need for truth in advertising.

The book is well illustrated with cuts and figures. Principles are made concrete by the description of actual procedure in the advertising campaigns of various successful stores. Sources of information such as various bureaus are cited and nontechnical methods of conducting individual investigations are given.

The author's occasional reference to psychology may be regarded as unfortunate. His list of instincts is especially open to question. It is to be deplored that writers in this and allied fields seem to think it necessary to drag a certain amount of psychology into their books, however much beside the point their use of it may be. Otherwise the author has succeeded unusually well in omitting all that is academic and narrowly theoretical. The omission of statistical methods from the discussion of investigations may not meet the approval of all, but it is entirely defensible in a book meant to serve as a practical guide in this field. In no way unusual in its outline, it is in the tying up of principles with practical concrete situations that the book's distinction lies. It is admirably suited to the purpose for which it was written.

AMOS C. ANDERSON,
Ohio University.

WILLIAM SCOTT GRAY. *Summary of Investigations Relating to Reading.* University of Chicago, Chicago, 1925. 275 pp.

This monograph contains a summary of investigations relating to reading which were made in America and England prior to July, 1924. It also contains a reference to some studies carried on in Germany and France.

The summary is made under sixteen different topics thus making its contents readily accessible to the student. There is an attempt to group under each topic the significant facts relating to it. Each chapter opens with a statement of the problem and concludes with a brief summary of the topic.

The monograph contains an annotated bibliography of four hundred thirty six titles. It closes with a fairly complete index.

The same author has continued the service rendered in the monograph by making a summary of reading investigations appearing between July 1, 1924, and June 30, 1925. This summary is found in The Elementary School Journal for February, March, April, and May 1926.

Such service as is rendered by the *Monograph* and series of articles appearing in the *Journal* will materially aid in unifying our thoughts relating to the problem of teaching reading.

MARTIN J. STORMZAND AND M. V. O'SHEA. *How Much English Grammar?* Warwick & York, Baltimore, 1024. 224 pp.

For many years our teachers have been striving to learn how much English grammar should be taught to the children in our schools. In the monograph by Stormzand and O'Shea, we have at least a tentative answer to the question. They have attempted to apply two criteria in an endeavor to select the grammatical topics that should have consideration. These two criteria are the complementary principles of usage and error.

The authors have examined ten thousand sentences selected from a wide range of material. This material includes sentences from standard prose, light fiction, editorials, business letters, and school compositions. It was the endeavor of the authors to select the sentences from representative sources.

These ten thousand sentences were analyzed to discover the frequency of the different grammatical topics and the errors occurring in their usage. The topics under which the analysis was made were those most frequently found in our text-book on English grammar. The topics used include sentence structure, clauses, phrases, parts of speech, and uses of nouns, pronouns, verbs, adjectives, and adverbs.

In presenting the results of the analysis, numerous tables and diagrams are used. These tables and diagrams show not only the distribution of topics according to *material* but also, according to the *school level* of those supplying the composition material. This two-fold distribution of the grammatical topics often yields results exceedingly significant. This is especially true when we take into account the frequency of errors found in the use of the same topics.

The conclusions from the data recorded are to say the least extremely suggestive of certain important, if not imperative modification of our courses in English grammar. The method used by the authors will no doubt be found defective in certain particulars and some of the conclusions based on the study will be found to be erroneous. However the study is of sufficient worth to warrant its further pursuit with the hope that a rational and useful selection of topics may be forthcoming for use in our courses in English grammar.

Willis L. Gard,
Ohio University.

W. I. Hamilton. *Employer-Employe Relations in Hotels.* The Williams & Wilkins Company, 1925. Pp. xii + 158.

The former director of the Research Bureau of the American Hotel Association tells how hotels are using and should use personnel methods comparable to those used by other large business enterprises. In part the book brings together in accessible form a series of articles published in the Hotel World. Managers and department heads of hotels for the first time have available a summary of the methods "for securing and maintaining a satisfactory and satisfied corps of workers' in their business. Here is a field with over three billion dollars invested in which personnel problems are certainly most urgent. Hotel employes traditionally include a large group of "roamers." The turnover, however, is not limited to the semi-skilled. If the statement of one hotel training school is to be trusted, the annual change of managers, housekeepers and chefs costs the hotels nearly four million dollars. Four chapters on training in hotels are particularly suggestive. With the exception of pensions, all the "fifteen good roads to good will in industrial relations" listed by the Metropolitan Life are found in hotels and described briefly. No hotel, however, has a properly functioning centralized personnel division, although some use the title of personnel manager. The author is familiar with the best personnel methods and makes helpful suggestions which are illustrated by concrete examples. When information is lacking, it is the fault of the business which is just beginning to give more systematic attention to improving its personnel. Its vaunted service to the public is rarely backed by corresponding interest in service for its own employes, although instances of notable achievements are described. Hotel men will surely find this authoritative review a pace maker. The publisher's attached list of its employes who made the book invites imitation.

J. B. MINER,
University of Kentucky.

M. E. HERRIOTT. *How to Make a Course of Study in Arithmetic.* Urbana, Illinois: University of Illinois, Educational Research Circular No. 37, 1925. 50 pp.

"The purpose of this circular is to indicate the application to arithmetic of the general technique of course-of-study making. The circular is intended to furnish a working basis and a guide to those who are making or revising the course of study in arithmetic" (p. 3). A general outline for an arithmetic course of study for the six grades of the elementary school is provided and the separate divisions of this outline are then discussed in some detail. The author has consulted a wide range of references and cites authority for most of the recommendations offered.

In the Appendix, which is somewhat longer than the main body of the pamphlet, a detailed course of study for grade IV is given to illustrate specifically the application of the principles previously discussed. The pamphlet includes a good annotated bibliography. This bulletin should be useful and valuable to teachers, superintendents, and others interested in the construction of a course of study in arithmetic.

R. L. MORTON,
Ohio University.

WILLIAM C. BAGLEY. *Determinism in Education.* Baltimore, Warwick and York, 1925. 194 pp.

The papers of Professor Bagley on what he believes to be deterministic trends in education, particularly in the uses and interpretations of "intelligence" test data, are so well known that a review of his book, *Determinism in Education,* may seem to be neither necessary nor justified. In this volume he has brought together, with some modifications and additions, his writings and public utterances on this subject for the four-year period ending early in 1925.

Most of the readers of this review probably have read these papers as they have appeared in educational periodicals; several have listened to one or more of the public addresses. It was the reviewer's good fortune to hear the address at Chicago in February, 1922, and also that at Columbus in May, 1923, as well as to read these and other papers as they became available.

To read what Professor Bagley writes is to be forcefully impressed with the clear vision, the almost invulnerable logic, and the excellent scholarship of the writer. To hear him speak is to be rendered veritably immobile and incapable of rejoinder, as has been demonstrated on more than one significant occasion. Courageous, indeed, is he who would debate in public the deterministic issue or any other issue with Professor Bagley.

But so replete with moot questions is *Determinism in Education* that an adequate review could hardly be undertaken in less space than was required for the book itself. The author holds that leaders in the field of intelligence measurement have ascribed too much of the individual's performance on an intelligence test to innate factors which "in themselves are practically unmodified by experience or training," that the innate factors which have been called "general intelligence" have never been clearly defined; that the facts do not justify the conclusions which the "determinists" have drawn but may quite as well or better support conclusions of an entirely different kind as to the effect of education upon one's intelligence; that growth may be both *vertical* growth, which may be definitely limited by one's inheritance, and *horizontal* growth which may continue through the life of the individual, *intellectual* growth being made up of both these types; and that the deterministic assumption, if generally accepted, would work havoc with our democratic ideals of social organization and control. There are many other contentions in the book but they seem to the reviewer to be subordinate to those which have been enumerated.

But few educators will refuse to grant that Professor Bagley has done a masterful piece of work in pleading his case. His utterances, too, have probably been timely and have doubtless had a sobering and steadying effect upon aggressive individuals who have been enthusiastic over the valuable offices of intelligence tests. His remarks have been disputed most vigorously and in greatly varying fashion; that was to be expected. Any other result would have been a surprise and, perhaps, a disappointment to him.

However, Professor Bagley's equal in logic and argumentation, if such exists, might be expected to make as strong a case against his claims as to the influence of schooling on intelligence as he makes against the determinist's contentions relative to the importance of the hereditary factors. After presenting and discussing his data, with heavy emphasis upon correlations, he draws rather sweeping and very emphatic conclusions. He states that he has "demonstrated that differences found among the median scores of contingents of recruits from the American states can be *amply explained* in terms of the educational facilities afforded by these states" (p. 122); that "the validity of the Army tests as measures of native intelligence-levels . . . . *has been proved to be a fallacy*" (p. 129); and that "the constructive program of the rational equalitarian" (p. 129) "cites the investigations which *prove beyond cavil* that schooling exerts a positive and powerful influence in stimulating the growth of native intelligence" (p. 130).[1] To present correlations between test scores and educational ratings of states as proof or ample explanation of the *causes* of those scores is to ask for a very liberal definition of "proof." That "correlation does not guarantee causation" is a statistical truism; yet "It is the contention of the writer that the studies reported in the present volume have overcome many if not most of the difficulties involved in distinguishing causes from concomitants in this complicated field of investigation" (p. 162).

Professor Bagley seems to have derived much satisfaction from Burt's study which resulted in the claim that "mental age" upon analysis turned out to be 33 per cent native intelligence, 11 per cent informal education and 54 per cent formal education (pp. 18, 76, and 134). It is unfortunate that someone had not indicated to him what many saw and what Messrs. Holzinger and Freeman very effectively pointed out,[2] viz., that the use of regression coefficients as percents is statistically unsound. Burt made the unfortunate blunder of assuming that these coefficients could be interpreted as percents because they happened to add up to approximately unity.

The author claims that present-day intelligence levels as shown by Army tests are clearly caused by the schools of the day when the drafted men were pupils. But these schools were established or supported by the parents of these pupils; they probably reflected their own intelligence levels in the quality of educational facilities which they furnished. Hence, the futility of interpreting correlation as causation.

The reviewer is glad that Professor Bagley has devoted a portion of his book to replying to his critics. He regrets, however, that Bagley's former pupil, Truman L. Kelley, was neglected. Kelley wrote what in the reviewer's opinion is the sanest and at the same time the cleverest of all the criticisms of the Bagley-Terman controversy.[3] He suggests, on the basis of assumptions which do not seem to be unduly naïve, that the stimulus which is of optimum value for an individual may be located above the individual's position on a native ability scale (perhaps one sigma distance above) and that the function of the teacher is to keep each of the greatly varying members of her group on his toes, as it were, in order that the maximum of benefit may be derived by each. Bagley contends that education is essentially a leveling up process (pp. 148–155). Kelley points out that "The only way to bring those of varying talent to a common level would be to give the dullards the optimum stimuli as judged by their talents, the medium somewhat less than the optimum as judged by theirs, and the bright much less than their optimum" (p. 16).

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[1] Italics supplied.

[2] Holzinger, Karl J., and Freeman, Frank N. "The Interpretation of Burt's Regression Equation." Journal of Educational Psychology, xvi, 577-582, December, 1925.

[3] Kelley, Truman L. "Again: Educational Determinism." Journal of Educational Research, viii, 10-19, June, 1923.

This review is becoming too long. The reviewer has said enough already to "get his foot in it." But he cannot close without reference to the author's definition of intelligence "as connoting the most important function of mind, namely, the ability to control behavior in the light of experience" (p. 157). He got a temporary thrill out of that for he thought the author would then define "mind," but was disappointed. The reviewer with his behavioristic leanings does not understand that definition. He wishes that Bagley would explain it.

R. L. MORTON,
Ohio University.

NEW BOOKS AND PAMPHLETS RECEIVED*

Books and pamphlets for reviews should be sent to James P. Porter, Department of Psychology, Ohio University, Athens, Ohio.

The Art of Seeing. CHARLES HERBERT WOODBURY AND ELIZABETH WARD PERKINS. Charles Scribners Company. 290. pp.

Case Studies in Educational and Vocational Guidance. JOHN M. BREWER MABELLE B. BLAKE, AND OTHERS. Ginn & Company, New York. 243 pp.

Experimental Psychology. MARY COLLINS AND JAMES DREVER. E. P. Dutton Company, New York. 315 pp.

Finding the Right Teaching Position. HARLAN C. HINES. Charles Scribner's Sons, New York. 200 pp.

The Humanizing of Knowledge. JAMES HARVEY ROBINSON. George H. Doran Company, New York. Price $1.50. 119 pp.

Indiana Rural Education Survey Committee Report. March, 1926. GEORGE W. FREEMAN, Chairman. Wm. B. Burford, Contractor for State Printing, Indianapolis, Ind. 130 pp.

The Influence of Nurture upon Native Differences. TRUMAN L. KELLEY. Macmillan Company, New York.

Measurement of Intelligence by Drawings. FLORENCE L. GOODENOUGH. World Book Company, Yonkers, N. Y. Price $1.80 173 pp.

Psychology of Everyday Life. JAMES DREVER. Methuen & Company, London, England. 164 pp.

Psychology of Industry. JAMES DREVER. E. P. Dutton & Company, New York. 148 pp.

Psychology of Persuasion. WILLIAM MACPHERSON. E. P. Dutton Company, New York. Price $2.50. 256 pp.

Psychology of War. JOHN T. MACCURDY. E. P. Dutton Company, New York, 91 pp.

Pupil Adjustment. WILLIAM CLAUDE REAVIS. D. C. Heath & Company, New York. 348 pp.

Self Direction and Adjustment. NORMAN FENTON. World Book Company. Price $1.40. 121 pp.

University of Iowa Studies in Psychology, Nos. IX and X. CARL E. SEASHORE, Editor. Psychological Monographs Nos. 167 and 168. Psychological Review Company, Princeton, N. J. 264 and 112 pages respectively.

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* Mention here goes not preclude further comment.

THE PREVALENCE OF CERTAIN POPULAR MISCONCEPTIONS

H. E. GARRETT AND T. R. FISHER

Columbia University

The existence of a very large body of popular misconceptions and their general acceptance even by those who by modern standards would be considered educated, is a matter of considerable interest to the psychologist. Several investigators have been interested in the problem. Peters (1) and Dresslar (2) have examined the prevalence and probable sources of certain of these beliefs, while Conklin (3) and Nixon (4) have investigated their incidence among college students.

Conklin found that more women than men admitted belief in current superstitions: the superstitious beliefs of the women centering around the home, love, marriage and death, while those of the men were more largely concerned with "luck" in sports, business, etc. Nixon used a questionnaire consisting of thirty statements, none of which has any real scientific basis in fact,—though many are widely accepted by the hypothetical man-in-the-street. These questionnaires were given to 140 women and 219 men, all students in elementary psychology classes in the extension divisions of Columbia University and New York University. Nixon's results showed that on the whole the women were more credulous than the men, the difference between the average number of statements marked "True," i.e., believed, showing a small—but reliable—balance in favor of the men. The order of prevalence for the 30 beliefs, as determined by the per cent marking each as True, was almost identical for men and women, the coefficient of correlation by the rank-method being 0.90.

No measure of general intelligence was secured by Nixon for either of his groups. For this reason it seemed to the writers worth while to repeat his questionnaire with a group for whom intelligence measures could be secured. At the same time, we decided that it would be of interest to take younger subjects than those examined by Nixon in order to compare the attitudes of the older and younger groups. Both of Nixon's groups were somewhat more mature—as well as more heterogeneous—than the usual college population, and accordingly they are probably more representative of the educational and cultural level of average (and somewhat above average) adults than a corresponding sampling of college men and women.

A Questionnaire

Directions: Below are a number of statements. Some of them you may consider true, some false. If you think a statement is substantially true, draw a circle around the T; if you think the statement false, draw a circle around the F. Where it seems debatable, mark as seems to you nearest correct.

1. T F The number of man's senses are five.
2. T F A child comes into the world with an instinctive knowledge of good and evil.
3. T F Certain lines in a person's hand fortell his future.
4. T F If you stare at a person's back you can make him turn around. This is a form of telepathy.
5. T F It is unlucky to have anything to do with the number 13.
6. T F A man's character can be read by noting the size and location of certain special developments on his head.
7. T F People with greenish eyes are not as trustworthy as people with blue or black eyes.
8. T F An expectant mother by fixing her mind on a subject can influence the character of her unborn child.
9. T F Women are inferior to men in intelligence.
10. T F People born under the influence of certain stars show this influence on their characters.
11. T F Intelligence can be increased by proper training.
12. T F Long slender hands indicate an artistic nature.
13. T F Beginning an undertaking on Friday is almost sure to bring bad luck.
14. T F If a man had faith enough he could heal a broken limb.
15. T F Many eminent men have been feeble-minded in childhood.
16. T F Some animals are as intelligent as the average man.

17. T F No defect of body or mind can hold us back if we have will-power enough.
18. T F Adults sometimes become feeble-minded from over-study.
10. T F All men are created equal in capacity for achievement.
20. T F The marriage of cousins is certain to result in children of inferior intelligence.
21. T F Especially intelligent children are apt to be weak and retarded physically.
22. T F The study of mathematics is valuable because it gives one a logical mind.
23. T F You can estimate an individual's intelligence pretty closely by looking at his face.
24. T F A square jaw is a sign of will-power.
25. T F A high forehead indicates superior intelligence.
26. T F A person who does not look you in the eye is likely to be dishonest.
27. T F Women are by nature purer and nobler than men.
28. T F Man is superior to the animals because his conduct is guided by reason.
29. T F Any physical or mental disease can be contracted by thinking too much about it.
30. T F Blondes are less trustworthy than brunettes.
31. T F Cold hands are the sign of a warm heart.
32. T F A person who holds his thumbs in his hands is a coward.
33. T F If your ears burn it is a sign that someone is talking about you.
34. T F Conscience is an infallible guide to conduct.
35. T F Silent men are generally deep thinkers.
36. T F Fat people are always good natured.
37. T F Women possess a power of intuition absent in men.
38. T F Chess and checker playing develop one's power of concentration.
39. T F The slow learner retains better what he gets than the quick learner.
40. T F Brains and beauty rarely go together.

First we increased Nixon's questionnaire from 30 to 40 statements by the addition of material of a like nature to that already included. This lengthened questionnaire, see this and the preceding page, was then given to 140 senior girls in the Washington Irving High School in New York City, and to 115 senior boys in the De Witt Clinton High School in the same city. The median age of both boys and girls was nearly

TABLE 1

Number of statements in the questionnaire marked true

NUMBER OF STATEMENTS MARKED AS TRUE	NUMBER OF SENIORS MARKING STATEMENTS AS TRUE	
	Boys	Girls
0	0	0
1	0	0
2	0	0
3	0	0
4	0	0
5	1	0
6	0	0
7	0	0
8	0	0
9	2	0
10	2	1
11	2	1
12	12	3
13	6	2
14	6	4
15	5	7
16	7	4
17	11	7
18	9	11
19	2	10
20	8	6
21	4	10
22	7	6
23	1	6
24	3	8
25	5	5
26	3	1
27	1	4
28	1	1
29	0	1
30	1	0
31	1	2
Total	100	100
Average	17.6	19.9
S.D.	4.72	4.46
$S.D._{Av.}$	0.47	0.45

Difference Av. 1–Av. 2 .... 2.3

$S.D._{diff.}$ 0.65

$\frac{D.}{S.D._{diff.}}$ 3.5

17 years. No formal directions were given; the subjects were simply told to circle the T before all statements which they considered true, and to circle the F before all statements which they considered false. To encourage rapid reading with a view to securing the first impression, a time limit of 10 minutes was set. This time limit served also to prevent comparisons of one paper with another.

Intelligence records could not be secured for all of the boys and girls tested. Accordingly, we decided to select just 100 individuals of both sexes for whom the records were complete, and to base our study on these two equal groups. Table 1 shows how many of the 40 statements were believed to be true by the members of each group. It will be noticed that with the exception of three boys all of both groups believed at least ten of the statements to be true, while one boy and two girls believed as many as 31 of the statements. The average number of statements marked true was 17.6 for the boys and 19.9 for the girls, a difference of 2.3. This difference—while small—is found to be reliable from the D/SD_D. The two groups vary to about the same degree around their respective means.

It is interesting to compare these results with those of Nixon. He found that the average number of statements believed to be true was 10.5 for his group of 219 men and 12.3 for his group of 140 women. Four men and one woman believed none of the statements, and with the exception of one man and one woman, no one admitted believing more than 20. Allowing for the fact that there were 10 more statements in our questionnaire, it is still evident that our boys and girls are considerably more credulous than Nixon's men and women. This result is certainly at variance with the popular opinion as to the sophistication and "show me" attitude of the younger generation. Nixon suggests that a low "superstition score," i.e., few statements marked true, may "mean greater familiarity with scientific knowledge, and it may merely mean greater caution." For children, few superstitions or misconceptions probably mean educated parents and a cultured environment.

TABLE 2

Orders of belief for 40 statements

STATEMENT NUMBER	IDEA INVOLVED	PER CENT OF SENIORS MARKING TRUE		ORDER OF BELIEF PREFERENCE	
		Boys	Girls	Boys	Girls
38	Power of concentration developed by chess and checker playing....	93	96	1	1.5
11	Intelligence increased by training..	92	92	2.5	4
22	Mathematics gives a logical mind..	92	93	2.5	3
28	Man superior to animals in reason..	88	91	4	5
34	Conscience an infallible guide......	82	96	5	1.5
1	Man's senses are five...............	69	80	6	7
17	Will power supreme.................	66	76	7.5	8
35	Silent men deep thinkers...........	66	87	7.5	6
18	Overstudy causes feeble-mindedness	65	56	9	19
37	Women possess intuition...........	58	64	10	13
6	Character indicated by head shape.	55	66	11.5	11.5
12	Artistic nature indicated by hands	55	61	11.5	15
4	Telepathic influence in staring.....	53	60	13	16
23	Face shows intelligence.............	51	72	14	9
27	Women purer than men by nature..	50	63	15.5	14
26	A shifty eye indicates dishonesty..	50	69	15.5	10
8	Prenatal influence..................	48	43	17	24
25	High forehead shows intelligence...	47	50	18	22
24	Square jaw indicates will power....	46	58	19	18
39	Slow learner a good retainer.......	45	59	20	17
16	Some animals intelligent as human..	43	66	21.5	11.5
21	Bright children physically retarded.	43	29	21.5	31
40	Brains and beauty not together....	37	53	23	20
36	Fat people good natured...........	36	19	24.5	33
29	Thinking may cause disease........	36	36	24.5	27
14	Faith can heal a broken limb......	34	23	26.5	32
2	Instinctive knowledge of good......	34	38	26.5	26
19	Men created equal in capacity.....	32	49	28.5	23
20	Marriage of cousins gives defectives	32	32	28.5	28.5
3	Lines in hand fore-tell future.....	24	51	30	21
10	Influence of stars on character.....	21	40	31	25
9	Women inferior to men in intelligence	20	7	32	36
31	Cold hands mean a warm heart....	18	15	33	34
15	Early feeble-mindedness of great men..........................	17	31	34	30
33	Burning ears someone talking......	15	9	35	35
30	Blondes less trustworthy...........	13	3	36	38.5
32	Coward holds thumbs in fists......	8	32	37	28.5
5	Thirteen unlucky..................	5	3	38	38.5
7	Green-eyed people untrustworthy..	4	2	39	40
13	Friday unlucky....................	3	6	40	37

Another comparison of our boys and girls can be made by determining the percentage of each group which marked each statement true. These per cents have been tabulated in table 2, and enable us to arrange the statements in an order of merit for belief. It is interesting to note that 93 per cent of the boys and 96 per cent of the girls believe that chess and checker playing develop one's powers of concentration, while an equal percentage of the girls believe that conscience is an infallible guide to conduct. Both groups are agreed that mathematics gives one a logical mind, and that intelligence can be increased by training. The three statements about which the boys are most skeptical are that Friday is unlucky, that thirteen is an unlucky number, and that green-eyed persons are untrustworthy. The girls agree with respect to the last two statements, but are not so skeptical about the bad influence of Friday. Only 3 per cent of the girls, however, believe that blondes are less trustworthy than brunettes (probably personal considerations entered in here!) while 13 per cent of the boys marked this statement true. Despite certain interesting variations, the orders of merit for belief in the 40 statements correspond closely for the sexes: the rank-order coefficient of correlation is 0.92.

The statements shown in table 2 seem to fall roughly into three groups. In the first group are those misconceptions most widely held, i.e., by from 95 to 50 per cent of both groups. The reason for belief in these statements is probably simply lack of scientific information, or as Nixon suggests, ignorance of the specific meaning given by the scientist to such terms as intelligence, will, feeble-mindedness, intuition, etc. The second group includes those statements marked true by from 50 to 25 per cent of the two groups. These deal largely with the pseudo-sciences of astrology and palmistry, as well as the widely popular ideas that character can be "read" from the face, or by certain bodily signs. Some come, too, from religion and from newspaper psychology regarding instincts, learning, and the effects of heredity. Such misconceptions as these are widely exploited by lecturers on so-called "applied psychology" and by advertisements of individuals who claim to teach concentration, character reading, or will-power development in five (or less) lessons. Certain magazines also do their part to keep them alive, and many religious and semi-religious organizations have not yet outgrown them. In the third group are those statements marked true by roughly 25 per cent and less of our subjects. These misconceptions are for the most part superstitions of the most primitive sort, and are held by only the most credulous. It is rather significant that the orders of belief for our groups of boys and girls is almost identical with the order found by Nixon for his group of 359 men and women. In nearly every case, however, a larger per cent of the boys and girls mark the statements true than of the men and women.

TABLE 3

	r(BOYS)	r(GIRLS)
Between I.Q. and Misconception Score	−0.02	−0.11
Between I.Q. and Misconceptions, chronological age constant	0.00	0.01

Since we had the I.Q.'s for all of the members of our two groups, correlations could be computed between intelligence and misconception scores, i.e., statements marked true. These are given in table 3. Note that the correlation between intelligence and misconceptions is entirely negligible both for the boys and girls whether we consider the entire r's, or the r's with chronological age held constant. Apparently, so far at least as our particular groups are concerned, general intelligence (defined as the capacity measured by the ordinary group intelligence test) has little influence in determining one's beliefs in the causation of many mental and natural phenomena. This result is again in line with that obtained by Nixon, who remarks: "While no correlations of class grades or intelligence scores with the number marked as true on this test have been made, it is interesting to note that some students who marked

20 or more statements (as true) have done very creditable class work."

This lack of correlation between intelligence and credulity seems to the writers to be the most significant result of this brief study. If our beliefs as to the causation of much in human behavior and natural happenings, as well as in the efficacy of certain signs and omens are not conditioned by intelligence, what, then, does determine them? The answer is not a simple one. Probably the largest single factor—as we indicated above—is lack of adequate information. The negroes of the South, as well as the white Nordics of the Tennessee mountains and the Kansas wheat fields are notoriously superstitious—and densely ignorant. That this is not the whole story, however, is indicated by the fact that many intelligent and fairly well educated people in New York City also believe in prenatal influence, that a square jaw is a sign of will-power, and that women are by nature purer and better than men. Others believe that we have an instinctive knowledge of good and evil, and that by faith we can heal a broken limb. Such ideas probably date back to childhood when the individual accepted them ready-made from his parents, the servants, and, unfortunately, in many cases from his religious teachers. Many have a strong emotional value for the individual who holds them. Uncritically received and acted upon, they have become well established habits which the individual finds hard to shake off, even when he grudgingly admits their improbability. In a sense they are a form of adjustment—albeit a primitive one—a means of putting oneself in rapport with a complex and little understood environment. Probably nowhere else do we see more clearly the clean-cut distinction between the fundamentalist and the scientist—between the naïve, uncritical, and mystical view of life and the scientific, rationalistic one.

We have not considered in this study the ways in which popular misconceptions and superstitions arise. For an account the reader is referred to Jastrow (5) and W. D. Howell (6).

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RATINGS OF DOWNEY WILL-TEMPERAMENT TRAITS

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PURPOSE OF STUDY

The aims of the present investigation were two in number: (*a*) to determine the extent to which persons can recognize in themselves and in friends with whom they have intimate contact the Downey will-temperament traits; and (*b*) the extent to which ratings of the Downey traits by means of personal judgments on self and on friends is related to the measurement of these traits by the Downey Group Will-Temperament Test.

SUBJECTS

Fifty-four college students were used; 24 men in one fraternity, and 30 women in one sorority. All classes from freshman to senior were represented.

METHOD

Two phases of the investigation are outlined below:

a. The Downey Will-Temperament Test was given to both fraternity groups.

b. Several weeks later the descriptions of the twelve Downey traits ("Sheet 1"), trait by trait, were read by the examiner to the subjects. Each subject was asked to rate himself or herself and his or her two roommates in accordance with the sheet of directions ("Sheet 2"). The examiner supplemented the descriptions by the reading of quotations from Downey's book. When each subject was satisfied as to the meaning of the trait, no further communication was permitted.

Each rated as adequately as he could in the light of his own judgment.

c. Profiles were drawn in which the rating of the test for each trait was indicated by a solid line, and the average rating of self + roommate A + roommate B was shown by a dotted line on the same chart. Both lines were labelled clearly. These profile charts were then sorted into groups of five each in such a way that each subject was presented with his own profile, that of his roommate A, that of his roommate B, and two others from his own fraternity. (Each person had lived with his roommates at least one-half year; frequently much longer.)

d. A reward of one dollar was offered to any student who could, after as much deliberation as desired, pick out from the group of five profiles the *two* representing himself and *either one* of his two roommates. It was evident that each tried to earn the reward.

RESULTS

Three persons out of the thirty girls succeeded in choosing correctly herself and either one of her roommates. (The men were not given the opportunity to select the profiles.) Since the element of chance alone will account for a certain number of successes in thirty such drawings, it is necessary to state the probabilities for and against the earning of the reward as a sheer matter of chance.

Let S represent the person's own profile; A represent the profile of the person's roommate A; B represent the profile of the person's roommate B; X represent the profile of some other sorority sister; Y represent a profile of some other sorority sister.

By chance, the following pairs of drawings would be possible, taking the profiles two at a time as the conditions stated: SA, SB, SX, SY, AB, AX, AY, BX, BY, XY. Of these, SA and SB would receive the reward. The probabilities stand, therefore, 2:10 or 1:5 in favor of chance success. In thirty trials, the expected number of successes would be $30 \times \frac{1}{5} =$

6.0. The probable error of this determination is given by the formula,

$$\text{P.E.} = 0.6745\sqrt{n\,p\,q} = 0.6745\sqrt{30 \times 0.20 \times 0.80} = 1.5$$

The number of actual successes was 3.0, the expectancy is 6.0 ± 1.5, and the actual successes fall short of the number attributable to chance alone by about 2 P.E. It must be concluded therefore that there was exhibited no indication that a person can select either his own or an intimate acquaintance's profile.

TABLE 1

Correlations of ratings and test scores for sll subjects

(30 women ans 24 men)

TRAIT	r_{CD}	r_{SA}	r_{SR}	r_{AB}
1	0.15 ±0.09	0.14 ±0.09	0.20 ±0.09	0.20 ±0.09
2	0.00 ±0.09	0.20 ±0.09	0.22 ±0.09	−0.01 ±0.09
3	0.01 ±0.09	0.66 ±0.05	0.63 ±0.05	0.32 ±0.08
4	0.00 ±0.09	0.00 ±0.09	0.33 ±0.08	0.08 ±0.09
5	0.10 ±0.09	0.00 ±0.09	0.16 ±0.09	0.18 ±0.09
6	−0.15 ±0.09	0.30 ±0.08	0.45 ±0.07	0.28 ±0.08
7	0.17 ±0.09	0.39 ±0.08	0.68 ±0.05	0.72 ±0.05
8	0.08 ±0.09	0.00 ±0.09	0.10 ±0.09	0.43 ±0.07
9	−0.06 ±0.09	0.30 ±0.08	0.47 ±0.07	0.35 ±0.08
10	0.14 ±0.09	0.20 ±0.09	0.12 ±0.09	0.21 ±0.09
11	−0.14 ±0.09	0.35 ±0.08	0.40 ±0.07	0.25 ±0.08
12	0.16 ±0.09	0.29 ±0.08	0.31 ±0.08	0.49 ±0.05
Means.......	0.04	0.24	0.35	0.29

Table 1 presents the correlations of the twelve trait scores on the tests with the ratings of self and roommates, and of the ratings of self vs. roommates, and of roommates vs. roommates.

The following symbols are used as subscripts in table 1:

D scores on the Downey tests
S ratings of the subject by himself
A ratings of the subject by roommate A
B ratings of the subject by roommate B
C composite rating of self and two roommates, thus $\frac{S + A + B}{3}$

CONCLUSIONS

1. There is no trait which shows a significant correlation of test scores and the composite rating of self and two associates. Whatever the test measures, the traits are not made clear to college students by means of the verbal descriptions which are given by the author of the test. Or else, the definitions of will traits furnished by the tests have nothing in common with the students' judgments of such traits in their intimate friends.

2. In seven of the traits, nevertheless, the students show considerable evidence of agreement on what a trait is, and in their judgments of the ratings of themselves and their fellows on these traits. The seven significant average correlations (averages of last three columns) from table 1 are:

	Average r
3. Flexibility	0.54
6. Self-confidence	0.34
7. Non-compliance	0.60
8. Finality of judgment	0.24
9. Motor inhibition	0.37
11. Coördination of impulses	0.33
12. Volitional perseveration	0.36

3. The student-student ratings show more tendency to be consistent among themselves (average r's 0.24, 0.35, and 0.29) than are the test-ratings (average r 0.04).

4. No evidence was found that a person can identify the profile of himself or an intimate acquaintance.

These negative results gain significance through the following considerations:

1. A real attempt was made to clarify the descriptions of each trait immediately prior to the registering of student judgments.

2. All raters were relatively mature college students and gave every evidence of sincerity and honesty of effort.

3. Each had previously taken the Downey test; this serving as a good working definition of the traits to be rated.

4. Each rated himself or a roommate intimately known to him during an association of one-half to three and one-half years.

5. A uniform rating scale was used which paralleled exactly the units employed by the tests.

SHEET 1

EXPLANATION OF THE SIGNIFICANCE OF THE "TRAITS"

Note: A score of 10 is the highest given. It would be received by the highest 10 per cent in a group of 100. Likewise a score of 1 would be received by the lowest 10 per cent of a group of 100.

1. *Speed of Movement:* The speed of movement relative to the size and age of the person scored.
2. *Freedom from Inertia or Load:* Tendency to work at one's highest speed without external pressure; little tendency to relax speed; quickness in warming up to a task.
3. *Flexibility:* Ease and success in readjustment; capacity to modify one's routine reactions.
4. *Speed of Decision:* Quickness in reaching a decision or conclusion. A slow reaction here may be due to caution or conservatism in weighing the elements involved in a situation, or be caused by one's being side-tracked by irrelevant matters, or by a rambling procedure.
5. *Motor Impulsion:* This trait refers both to impetuosity and energy of reactions. Consider the ease with which brakes or inhibitions are removed and also the tendency to an explosive reaction when the brakes are actually off.
6. *Assurance or Self-Confidence:* This refers to the degree of confidence with which one maintains his opinion against contradiction. A *9* or a *10* reaction signifies an aggressive reaction—the burden of proof being thrown on the person doing the contradicting; *7* and *8* are confident reactions but reasons are often cited for one's confidence and the burden of proof is accepted; *5* and *6* are tactful reactions; and below *5* there is a grading down to complete failure to assert one's own opinion.
7. *Resistance or Non-Compliance:* The vigor with which one reacts immediately to a blocking of one's purpose. It grades from strenuous reaction to complete passivity in the face of opposition.
8. *Finality of Judgment:* Care used in making final judgments, or, assurance of correctness of first judgments.
9. *Motor Inhibition:* Capacity to keep in mind a set purpose and to achieve it *slowly*. It involves power of motor control, imperturbability, and patience.
10. *Interest in Detail:* Attention to details. This trait is not equivalent to accuracy which usually carries an implication of power of keen analysis. One may possess great capacity for detail and yet lack penetration in the selection of details. Care for detail is more evident in the execution of a plan than in cleverness in making a plan.
11. *Coördination of Impulses:* Capacity to execute a double task without a preliminary trial; capacity to handle a complex situation without

forgetting either factor involved. This trait is probably allied to keeping one's head in a confusing situation.

12. *Volitional Perseveration:* Persistence in efforts. Willingness to make repeated trials at betterment of effort in doing a task of some difficulty.

SHEET 2

Rating Form for Will Traits

Date......................Name of Rater..............................

Directions: Read over the descriptions of the traits on the sheets of instruction carefully. The trait descriptions are verbatim quotations and hence cannot be modified or amplified for present purposes.

Note 1. *Try to use every point on the scale, i.e., all the degrees from 1 to 10. This is the only way that valid and discriminating ratings can be secured.*

Note 2. It is usually advisable to rate all subjects on Trait 1, then on Trait 2, etc., rather than attempting to rate the traits in order for one subject before proceeding to the next subject.

Note 3. *Enter your rating in the columns below; taking care that your rating on Trait 1 is in the column for Trait 1, that for Trait 2 in the column for Trait 2, etc.*

NAME OF SUBJECT	TRAITS (SEE INSTRUCTION SHEET FOR NUMBERING)											
	1	2	3	4	5	6	7	8	9	10	11	12
1.........................	...	...	...	...	...	...	...	...	...	...	...	...
2.........................	...	...	...	...	...	...	...	...	...	...	...	...
3.........................	...	...	...	...	...	...	...	...	...	...	...	...
4.........................	...	...	...	...	...	...	...	...	...	...	...	...
5.........................	...	...	...	...	...	...	...	...	...	...	...	...
6.........................	...	...	...	...	...	...	...	...	...	...	...	...
7.........................	...	...	...	...	...	...	...	...	...	...	...	...
8.........................	...	...	...	...	...	...	...	...	...	...	...	...
9.........................	...	...	...	...	...	...	...	...	...	...	...	...
10........................	...	...	...	...	...	...	...	...	...	...	...	...

THE OPINIONS OF COLLEGE STUDENTS

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The opinions of college students may have very little effect on the course of the world. Obviously they reflect the early environment in which these students have been nurtured, plus a certain amount of reading with deliberations. But such opinions may still be worthy of our study from two points of view. They may show us to some extent the influence that college training is having on student opinion. They may also give us valuable indications of the intelligence or other characteristics of individual students.

It is not entirely correct to say that a man's opinions will determine his actions, but there are certain ideas, or beliefs which set a limit to behavior. A man who is decidedly liberal in the conceptions of religion, i.e., one who is decidedly skeptical regarding the divinity of Christ and personal immortality, will have difficulties to say the least if engaged in religious or social work under a thoroughly conservative individual.

But radicalism or liberalism is not all that counts in the field of ideas. There is also the question of how certain a person is, how strongly convinced he is. To be positive and certain of one's convictions is a valuable trait in many situations. It is undoubtedly valuable for the executive who must make plans and carry them through. A point of view thoroughly believed in lies more or less consciously in the background as an organizing force for other ideas or viewpoints. If I am once thoroughly convinced that large inherited masses of wealth are unjust, my whole set of economic ideas may become organized about this one. It is well known that ideas are inter-locked in this way, although there may be some curious contradictions in individuals.

Another value in holding certain positive convictions is the fact that the individual is released for other things. It is mental economy to have settled a point, and not hold it in reserve for further consideration. It is conceivable that men can accomplish more when they first read a new research, if they take the attitude of Darwin, who said that his first tendency was to believe wholly in the validity of the writer's view. It was only at a later reading that a spirit of cautious skepticism crept in.

Your Opinions and Convictions

Consider each of the statements below. If you are strongly convinced that a statement is true, underscore "2" on the extreme left. For example before the statement "the world is approximately a sphere," you would probably underscore "2" because you have evidence, or are otherwise sure of it. Underscoring "1" means that you are fairly certain a statement is true, or that it is more right than wrong. If you draw a line under "0," it means that you are entirely uncertain, that you have no opinion on the subject. Underscoring "−1" means that you consider it more wrong than right, and "−2" indicates that the statement is entirely false, that no reasonable person would consider it true.

2 1 0 −1 −2 There is more justice and real democracy in the United States than in any other country in the world.
2 1 0 −1 −2 The young people of today are no more immoral than the young of two or three decades ago.
2 1 0 −1 −2 Bluffing is poor policy in professional life. The better doctors, lawyers and business men avoid it.
2 1 0 −1 −2 The world at present is more wholesome than at any other period. Men are more unselfish and social-minded.
2 1 0 −1 −2 Modern advertising is a social blessing.

2 1 0 −1 −2 Our government is controlled by great financial interests.
2 1 0 −1 −2 Working men should organize into labor unions. It is the only method to insure fair treatment.
2 1 0 −1 −2 The expert mechanic should get about the same as the business executive.
2 1 0 −1 −2 Newspapers are afraid to tell the truth. They are over-influenced by men of wealth and special privilege.
2 1 0 −1 −2 Poor men cannot get justice in the courts.

2 1 0 −1 −2 One cannot be healthy and at the same time smoke tobacco and drink strong coffee.
2 1 0 −1 −2 The man who persists in exceeding the speed limit on the public highways should be jailed like other criminals.
2 1 0 −1 −2 A student in high school or college caught cheating in an examination should be suspended from school.
2 1 0 −1 −2 First degree murderers, when caught, properly tried and convicted, should be executed.
2 1 0 −1 −2 High school students today are not required to work (study) as hard as they should for their own good.

2 1 0 −1 −2 It is better to have a world full of clever happy men without ideals than stupid unhappy men with ideals.
2 1 0 −1 −2 The thrill and romance from moving pictures are good substitutes for social life and other recreations.
2 1 0 −1 −2 It is harmless for young people who are not engaged to kiss each other secretly.
2 1 0 −1 −2 People who are unhappily mated should be allowed a divorce even when there is no adultery.
2 1 0 −1 −2 Dancing is more apt to be morally good for one than bad. The ill effects on one's thoughts are rare.

2 1 0 −1 −2 Where religion is antagonistic to modern science, religion should be allowed precedence.
2 1 0 −1 −2 It is better for a teacher to teach unproved truth than error which he earnestly supports with evidence.
2 1 0 −1 −2 The religious missionary is on the average the great altruist, as he is thinking only of the good of others.
2 1 0 −1 −2 There is plenty of justification for the belief in a life after death.
2 1 0 −1 −2 Man was created directly by God, and not indirectly from lower animal forms as evolution teaches.

A high degree of certainty in various common ideas may, however, make a man less valuable in many occupations. He is no doubt less pliable in fitting into the attitudes of an organization. He may make a poor administrator in certain fields where ideas are changing rapidly.

Another distinction which is available in considering a man's attitudes or opinions is his tendency to avoid any opinion. Out of 25 questions, one student will have opinions for or against the issue in 23 cases and complete doubt or indifference in only two; another student has opinions in only 13 of the cases. A high index of doubt signifies caution, but more than that probably a degree of narrowness in the questions concerned.

One other trait which is discernible in many students is the tendency to accept a statement in its positive form. In other words certain students are highly suggestible in that they react in favor of ideas or statements, while others are inclined rather to oppose statements as presented to them.

The set of 25 statements, with instructions, found on page 428f, were given to 248 college freshmen, 76 upper class students (almost entirely seniors), and 94 students in the midst of their second year of law. The law students were selected for two reasons: (1) these men are to deal primarily with social and political situations, where abstract social opinions count or at least are often considered; (2) it was suspected in going over the blanks submitted to freshmen that those students electing to follow medicine or a branch of science differed in the nature of their responses from those students who hoped to take up law. Hence it was thought there might be a legal type which should be taken into account by a personnel office.

The 25 questions divide up into five groups of five questions each. The first five deal with questions of national and social optimism. The second set are on the labor problem and economic status in general. A third group deals with discipline, a fourth with social life and the conventions, while the fifth is in the religious field.

An outstanding feature is the wide range of responses to every statement given. Hardly a statement escapes being scored under all five headings: −2, −1, 0, 1, 2. To be sure, some statements are marked preponderantly plus while others are scored minus, but an average score for a question has practically no meaning on account of the wide range of reactions to each. For example on the statement "Our government is controlled by great financial interests" the results of the 418 answers are:

Strongly convinced	59
More true than false	136
Uncertain	55
More false than true	103
Convinced it is wrong	65

The most significant general educational implication is the slight effect that a college training has had on the real opinions of our students who are now seniors in the Arts and Science college. There is almost as large a proportion in the senior class who are conservative or reactionary in their responses as in the freshmen class. Apparently this type of opinion is influenced far more by home training and religious disposition than by what the students are taking away from their college courses.

Only in some questions dealing with economic status and with religion is there any decided difference between seniors and freshmen. In the economic type of question the seniors *are apparently more conservative than the freshmen. They* tend to believe more generally than do the freshmen that the "expert mechanic should *not* get about the same income as the business executive," and also that "poor men *can* get justice in the courts." That is, the freshmen wabble about the center of the possible responses (perhaps because they are suggestible in favor of positive statements), whereas the seniors choose the negative side of the statement as put in the blank.

Religiously the seniors tend to be far more liberal than the freshmen. On the last two questions of the series particularly, there is a distinct cleavage. Seniors are skeptical (i.e., hover around 0) on the question of life after death, while the freshmen are for the most part convinced that there is plenty of justification for such a belief. Freshmen also lean towards a belief in opposition to evolution, whereas seniors tend to accept evolution, the men being strongly opposed to the statement as found in the blank. This is true in spite of the fact that the proportion of Protestants, Catholics and Jews remain about the same: approximately 50, 25 and 25 per cent respectively.

The sex differences are also less significant than one might expect. There is a more conservative attitude of the men in economic questions, and a distinctly more conservative attitude among women in the religious questions. In the field of social relationships there is relatively little difference. Men are more inclined than women to be skeptical about the elevating influence of dancing and to want the first degree murderer hung; while women are slightly more apt to feel that divorce is undesirable. Women tend to be more convinced in their opinions than men in the arts college, but less certain on the average than law students of similar age. In all other general respects, there is no significant difference.

Law students in the upper classes do not differ markedly in their opinions from other men. They are somewhat more conservative in economics and also in religion, particularly in the latter field. The majority of law students seemed to be strongly opposed to evolution, whereas very few upper class arts men still hold this belief.

In one other respect there is a difference, in the degree of the certainty of conviction. The law students tend rather strongly to favor plus or minus 2. In fact, 53 per cent of the responses indicate certainty, whereas only 45 per cent of the responses of the arts men show this same certainty. From a different angle, it appears that the median amount of certainty among a group of law students about equals the upper 25 per cent point, according to certainty, for arts students. This difference can be seen plainly in the freshman class as a whole. Freshmen who were considering law as a vocation are considerably more apt to underscore a plus or minus 2 than those who were going into medicine or a science career. Perhaps this is a real hint then for those who are interested in the analysis of personality with a view to vocational guidance.

In attempting to relate the different quantitative values obtainable from such a study of opinions with the results of intelligence tests, the correlations found were very small. There was a slight positive relationship between intelligence scores (as obtained from the examination of the Educational Research Council) and certainty, and also with the tendency to be radical, but the correlations are all less than 0.20. However this is no reason for disparaging this type of test. "Certainty," for example, appears to have a fairly high reliability coefficient. Even with 25 items, the correlation index between odd and even numbers is 0.71. The more measures we have which are valuable and at the same time poorly related to intelligence the better off we shall be, as they may be used to supplement the results of intelligence testing. What any man does is only partly a product of his intelligence. There are also various emotional factors which may contribute to the degree of one's instability or forcefulness.

"Indifference" and "radicalism" and "suggestibility" are none of them as significant with as small a number as 25 statements. Their coefficients of reliability amount to about 0.5, whereas correlations with intelligence are hardly more than 0.1. There is a slight tendency for the more intelligent man to be more radical and more positive but less suggestible than the average.

The analysis of individual records shows decidedly interesting and characteristic bents, at least for the senior students whom we have come to know quite well. Here is a senior, brilliant, artistically inclined, with an intense desire to be a teacher of English in a college. He is inclined to be strongly convinced of his point of view, and radical on most questions, though in spots he takes a strictly conservative attitude. He is not consistent with himself in spite of strong convictions and no feelings of indifference or doubt. His teachers know this man to be a most interesting student. He shows brilliant analyses and raises interesting questions in a class room. He does not conform to any pattern, but seems often prejudiced by minor items. He will doubtless be a creative contributor in one or more of the fields of art, perhaps because he is not bothered by consistency.

Another man of the senior class, typically a scientist, is extremely cautious in all his attitudes. He is really convinced of the truth of but few of the statements, but is thoroughly consistent when he does react. In the case of eight of the 25 statements, he underscored "0" which means that he has no fixed opinion. This man is known around college to be somewhat narrow, decidedly timid in his expressions, but one of the two or three ablest men in the group interested in science. He is being considered for an assistantship in one of the departments.

An attractive girl of fair scholarship but with a particular bent toward social leadership and with occasional high grades, showing superior insight in certain courses, has been invited to go into church work with a very conservative religious group. She, however, is thinking seriously of teaching. A glimpse of her reactions to this outline are interesting. She is 64 per cent liberal in her views, particularly in religion. She takes two attitudes which would seem to interfere seriously with her happiness and interest in continuance in religious work. She believes that where there is a conflict between religion and modern science, religion should *not* have precedence. Then she strongly believes that a world full of clever happy men without ideals would be superior to stupid unhappy men with ideals. She also is inclined to doubt a justification in a belief in life after death.

Certainly this combination of beliefs would be unfortunate in a conservative religious organization.

One senior who has been a very well liked leader among the girls, shows herself up as strongly disposed to accept the positive side of all statements. She has only scored the negative side in four statements. In spite of a fine liberal enthusiastic attitude, she is apparently so suggestible as to allow a statement to swing her to the point of inconsistency.

A very superior science student has a large per cent of "0" and "1" underscored, but she is strictly consistent. She is particularly a severe disciplinarian, but otherwise inclined to be quite liberal.

It is significant that professors who come into the personnel office of the university do repeatedly turn to the reactions of students to these statements. They are, in fact more interested in them than in the number or type of books read, the subjects of greatest interest in high school, religion, scores of intelligence tests, and a host of other things which are available in the folders for each student.

TABLE I

		ARTS WOMEN	ARTS MEN	LAW MEN
Questions of:				
Optimism	(1)	+	+	+
	(2)	+	+	0
	(3)	+	+	+
	(4)	0	0	0
	(5)	0	0	0
Economic (Labor Attitudes)	(6)	0	0	–
	(7)	+	+	+
	(8)	0	–	–
	(9)	+	0	0
	(10)	–	–	–
Discipline	(11)	0	0	–
	(12)	+	+	+
	(13)	+	+	+
	(14)	0	+	0
	(15)	0	+	0
Social Conventions	(16)	–	0	0
	(17)	–	–	–
	(18)	0	0	0
	(19)	+	+	0
	(20)	+	+	+
Religion	(21)	0	0	0
	(22)	0	0	+
	(23)	+	0	+
	(24)	+	0	+
	(25)	0	–	+

An employer interviewing a prospective candidate in teaching wants to know what she thinks, or what her opinion is. Unquestionably an evaluation of personnel opinions can be made a part of the scientific study of personality.

TABLE 2

Percentage of statements underscored indicating complete doubt, certainty, positiveness and radicalism

	NUMBER OF CASES	COMPLETE DOUBT (PER CENT "0")	CERTAINTY (PER CENT "2" OR "−2")	POSITIVENESS (PER CENT "1" OR "2")	RADICALISM
Women freshmen	78	10.5	51	62	32
Women seniors	54	8.4	46	58	45
Men freshmen	170	13.5	46	62	32
Men seniors	22	9.2	44	55	40
Men law students	94	6.9	53	57	35
	418				

Table 1 gives a summary of the commonest attitude of men in the arts college, women in arts, and men in law school, for each of the 25 statements as listed. The symbol "+" indicates a distinct leaning in favor of the positive statement, "0" indicates no definite swing to either side, while "−" stands for an attitude in opposition to the statement. Table 2 summarizes certain general tendencies.

MENTAL FATIGUE OF INDIANS OF NOMADIC AND SEDENTARY TRIBES[1]

THOMAS R. GARTH

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Previous studies of mental fatigue among races indicate that there are racial differences in this phase of mental work as between full-blood Indians of nomadic tribes, whites and negroes. Particularly in respect to accurate performance is this found to be true since the measures of differences, as taken from the overlapping run, using the white medians as bases, for Indians, the young ones, 70.4 per cent, the older ones, 63 per cent; for negroes, the young ones, 19.3 per cent, the older ones, 14.5 per cent (1). When we consider mixed-blood Indians in respect to mental fatigue we find that in accurate performance, they seem to occupy a middle ground between whites (2) and full-blood Indians though in attempted performance they tend to be more speedy than the whites and less speedy than the full bloods, by this same measure of overlapping (3).

The question arises as to whether or not this may be said to hold of sedentary Indians as well as of those of nomadic tribes. On a basis of actual scores, with intelligence tests—N. I. T. Scale A—it was found by the writer that age for age the nomadic Indians are more intelligent than the sedentary Indians (4), though to be sure, social status and proximity to representatives of the white civilization favored the nomadic tribes here examined more than the sedentary tribes.

The nature of a correlation between ability to hold to a mental task such as the one made use of in the present experiment and intelligence is as yet unknown. It is a problem whose solution may be undertaken later on. However, the results appear on the face of things to indicate that there is no correlation of a significantly positive sort as respects intelligence of nomadic full-blood Indians, mixed bloods, and whites as racial groups because measures of intelligence of these groups show just the opposite tendency as compared with the tendency in measures of mental fatigue. Thus it would seem that the work curve test used in the present experiment does not measure intelligence though the results indicate racial differences in the work curve.

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[1] Paper read before the American Psychological Association, December, 1923, at Madison, Wisconsin.

In this study our problem is: If full-blood Indians of nomadic tribes are able to resist the onset of mental fatigue as here measured more successfully than whites, or mixed bloods—representing a mixture of white blood and nomadic Indian blood—is it just a matter of Indian blood so regarded or could it be due to the tribal habit of nomadism as distinguished from that of sedentary practices?[2]

We do not mean at all to attack here the problem of acquired characteristics. That would be too large a task just now. But we wish in fact to avoid facing such a biological problem by saying that the Law of Survival of the Fittest could easily account for any difference here to be found in comparing nomadic and sedentary Indians since the law would work with more rigor among nomadic Indians than among those of sedentary habits. Nor would we go back of the bare statement of fact of Indian blood to its origins, rather would we leave that for the anthropologist. We are merely granting tentatively that the origins of the Indian bloods here considered are the same, and following that we are saying that some of its ancestry followed nomadic habits and some sedentary habits.[3]

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[2] The data for the sedentary Indians were obtained by the writer on an expedition made possible by courtesy of the Grants Committee of the American Association for the Advancement of Science.

[3] The classification of these Indians as nomadic and sedentary was made at the suggestion of Prof. James E. Pearce, Professor of Anthropology, University of Texas.

From an interest in what was going on in the minds of the subjects in addition to the originally behavioristic phase of this study we have undertaken to find out something of the subjective states of these psychologically untutored subjects and as a matter of sheer curiosity we obtained from them something like introspection at the end of the experiment.

The materials of the experiment were the Thorndike Addition Sheets arranged in two kinds of tablets, that is of fourteen sheets and twenty-one sheets respectively, the tablets of fourteen sheets being used by younger subjects and the ones with twenty-one sheets being used by the older subjects. The subjects were full-blood Plains and Southeastern Indians and Pueblo, or Plateau Indians found in the United States Indian Schools of Chilocco, Oklahoma and Albuquerque, Mew Mexico; the Chilocco Indians, representing the nomadic Indians and the Albuquerque Indians the sedentary Indians. The subjects of the younger sub-groups of Indians had attained as high as fourth grade—excepting five of these—in the United States Indian Schools and those of the older sub-groups had attained the seventh and eighth grades in these schools.

The ages of the nomadic group averaged for the younger and older subjects 15.7 and 18.3 years respectively. In the sedentary sub-groups the average for the younger subjects was 11.8 years and for the older subjects it was 16.2 years. Following we have the *grade composition:*

BLOOD GROUPS	NUMBER IN THIRD GRADE	NUMBER IN FOURTH GRADE	NUMBER IN FIFTH GRADE	NUMBER IN SEVENTH GRADE	NUMBER IN EIGHTH GRADE
Nomadics....	5	54	2	27	20
Sedentary................		57		45	21

This gives for the younger subjects: Nomadics, 61; sedentary Indians, 57; and for the older subjects we have, nomadics, 47; sedentary Indians, 66. Both nomadic and sedentary groups are to be regarded as composed of full bloods altogether if we may take the statement of degree of blood from the United

States Indian School records and the statements of the subjects themselves.

The sexes are about equally distributed, as follows:

	YOUNGER SUBJECTS		OLDER SUBJECTS	
	Males	Females	Males	Females
Nomadics	25	34	31	17
Sedentary	31	26	29	37

The work curve experiment has been described elsewhere as to its administration (1). The younger and older subjects work continuously for twenty-eight and forty-two minutes respectively. At the start their good-will is obtained by getting their consent to see who is the "best adder in the class" and the experiment is playfully characterized as a "race." No interruption on the outside or interference of any sort is permitted while the performance is going on. No motivation in addition to what is offered at the start is given at any subsequent time during the work period. In fact great pains are taken to keep the conditions of the experiment constant so that the individual subject's internal efficiency as a worker will be indicated by the results on the data sheets. Only two minutes are spent on a sheet and every subject works on the same sheet each two minutes. At the end of the experiment the subjects were asked to write on the work curve tablets whether they were "not tired," "a little tired," just "tired," or "very tired." To be sure the subjects are inexperienced introspectionists but we offer this for what it is worth.

The original data for this experiment were found in the tablets after the subjects had carried out the instructions. The data were handled thus:

1. To ascertain the number of columns a subject attempted each two minutes.

2. To find out what was accurately performed each two minutes.

3. Attempted columns and accurate columns for an individual were totaled.

4. From these totals were obtained the per cent accurate for each two minutes and likewise the per cent attempted for each two minutes.

5. Number 4 gave what we have called individual work curves expressed as per cents.

TABLE 1

Showing average of the individual curves for fourth grade full-blood Pueblo (sedentary) Indians

PERIODS	PER CENT ATTEMPTED			PER CENT ACCURATE		
	Average	A.D.	P.E.	Average	A.D.	P.E.
1	7.1	1.7	0.2	8.1	5.8	0.6
2	6.8	1.1	0.1	8.7	4.8	0.5
3	7.3	1.8	0.2	7.7	4.3	0.4
4	7.2	1.4	0.1	8.8	4.6	0.5
5	6.8	1.4	0.1	6.7	3.7	0.4
6	7.5	1.1	0.1	7.9	4.6	0.5
7	6.1	1.1	0.1	5.5	3.5	0.4
8	6.2	1.1	0.1	5.1	3.6	0.4
9	6.5	0.6	0.1	7.0	4.6	0.5
10	7.8	1.1	0.1	6.5	4.5	0.5
11	7.7	1.3	0.1	8.2	5.2	0.6
12	7.3	1.5	0.2	8.4	6.2	0.7
13	7.4	0.8	0.1	6.4	4.1	0.5
14	7.5	0.6	0.2	6.4	4.6	0.5

6. These individual curves, as in number 5, were combined into group curves called the average of the individual curves. This made group curves of per cents of total attempted and accurate performance, i.e., two curves for any sub-group of subjects. Table 1 will show the data[4] for the curve for attempted and accurate performance of the sedentary sub-

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[4] The data for all blood groups except that of Pueblo Indians has been previously published in Journal of Applied Psychology, vol. iv, pp. 242, and vol. vi, pp. 336.

groups of fourth grade and table 2 will give the data for attempted and accurate performance of seventh and eighth grade sub-group. These data are in the form of average, average deviation, and probable error of per cents for each two minutes.[5]

TABLE 2

Showing average of the individual curves for seventh and eighth grade full-blood Pueblo (sedentary) Indians

PERIODS	PER CENT ATTEMPTED			PER CENT ACCURATE		
	Average	A.D.	P.E.	Average	A.D.	P.E.
1	5.5	1.1	0.1	6.1	2.5	0.3
2	4.4	0.8	0.08	5.5	2.5	0.2
3	4.8	0.8	0.07	5.5	2.3	0.2
4	4.8	0.8	0.09	5.8	2.1	0.2
5	4.3	0.9	0.08	4.3	1.6	0.1
6	4.6	0.7	0.06	5.1	3.3	0.3
7	4.3	0.6	0.04	4.3	1.8	0.2
8	4.6	0.4	0.08	4.2	2.1	0.2
9	4.7	0.7	0.08	4.1	2.1	0.2
10	4.5	0.8	0.10	3.8	1.8	0.2
11	4.6	0.9	0.08	4.0	1.9	0.2
12	4.6	0.8	0.04	4.2	1.9	0.2
13	4.8	0.4	0.09	4.3	2.7	0.3
14	4.3	0.8	0.04	4.0	2.2	0.2
15	4.9	0.4	0.07	4.2	1.7	0.1
16	4.8	0.7	0.06	4.6	2.0	0.2
17	4.8	0.6	0.10	5.2	1.6	0.1
18	5.2	0.9	0.07	4.9	1.8	0.2
19	4.4	0.7	0.11	4.2	2.4	0.3
20	5.4	1.0	0.12	4.8	2.4	0.2
21	4.8	1.1	0.12	4.1	2.2	0.2

Figures 1, 2, 3, and 4 give a graphic representation of attempted and accurate performance for the younger and older sub-groups in the form of smoothed-out curves.

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[5] The writer acknowledges the assistance of two of his graduate students, Miss Helen G. Mercer and Miss Florence Mercer in handling the data for the sedentary Indians.

It will be seen that the curves for nomadic full-blood Indians are somewhat different from those of the full-blood sedentary especially in the case of those representing efficiency

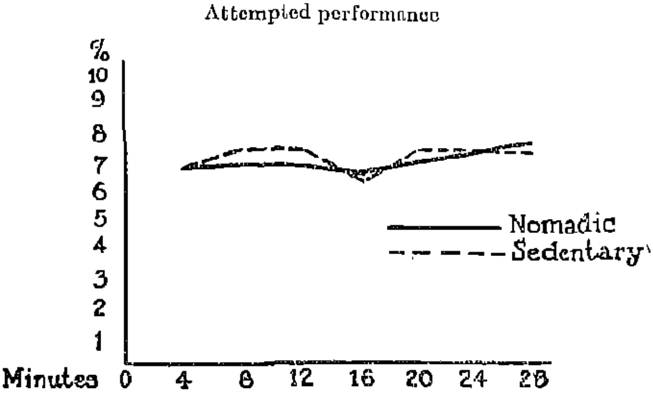
Attempted performance

FIG. 1. AVERAGE OF THE INDIVIDUAL CURVES FOR YOUNGER SUBJECTS

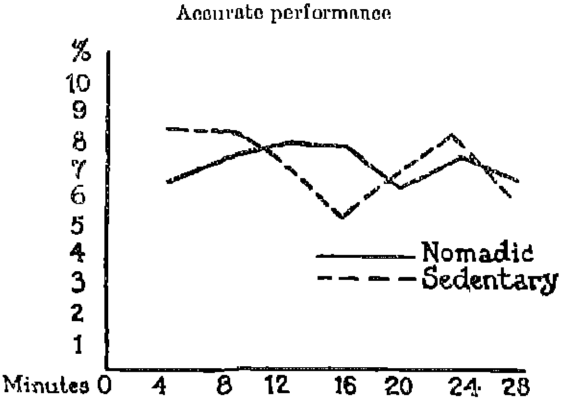
Accurate performance

FIG. 2. AVERAGE OF THE INDIVIDUAL CURVES FOR YOUNGER SUBJECTS

during the accurate performance. In all curves the sedentary Indians tended to do more of the work at the start than did the nomadic Indians. With the former we find a tendency, toward initial spurt in all the curves but the attempts curve of the younger subjects while there is warming-up indicated with the latter. If we take into consideration the curves at the ends we note that always the nomadics are better than the sedentary subjects though sometimes there is only a slight advantage as in the case of the two curves for attempted performance for the younger subjects. The curves for efficiency during the attempted performance are more nearly similar than are those representing that for the accurate performance. They also appear to fluctuate less, however, from the appearance of the

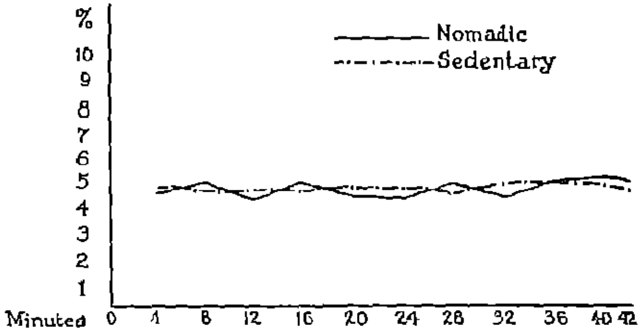
Attempted performance

Fig. 3. Average of the Individual Curves for Older Subjects

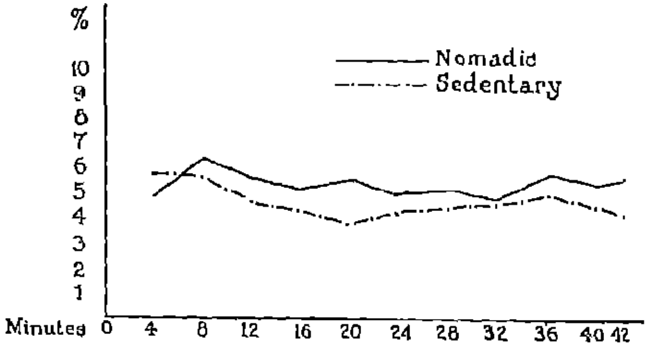
Accurate performance

Fig. 4. Average of the Individual Curves for Older Subjects

curves themselves merely, the nomadic sub-groups seeming to have the advantage over the sedentary Indians. The former appear to get more practice effect as indicated by the curve slopes than the latter.

The term "mental fatigue" is used here in a restricted sense and not in the way in which the popular mind regards it. Even the word "mental" has had its purgings until the dynamic psychologist and the untutored person may converse only with embarrassment. Since the situation in this experiment was so planned that external factors could scarcely hinder the performance once started and all hindrances to work setting in later must be of an internal and subjective nature set up by the performance, i.e., actual loss of neural efficiency, ennui due to the task, interference of mental processes, such as perseveration and overlapping, feeling of being tired due to distraction, of actual physical fatigue induced by strain, the annoyance of inhibiting tendencies to do something else besides the task in hand; and since these internal and subjective states are probably bigger factors than the mere motor processes of writing included in the performance whose results measure in terms of speed and accuracy in an objective fashion the mental work as handicapped by the above mentioned internal states, we may with these qualifications, say that the objective results measure an internal condition of efficiency (5) and may call the loss of efficiency an internal or "mental fatigue." To be sure this complex is not the old mental fatigue of the popular mind.

We take here as a measure of loss of efficiency the results of a comparison of efficiency at start and finish of the total continuous work period. By referring to table 3 we find that the nomadic Indians excel the sedentary Indians in resisting fatigue in both attempts and accurates categories, but more in the latter than in the former. In attempts for the nomadic younger sub-group there was a gain of 6.8 per cent, while for the younger sedentary Indians there was a gain of 4.7 per cent; and in the accurates category the figures stand 8 per cent gain for the former and 13.4 per cent loss for the latter. For the older sub-group the nomads experienced in attempts a gain of 5.9 per cent and the sedentary subjects of that sub-group a loss of 1 per cent. In accurate performance for the older sub-groups the nomadics had a gain of 0.3 per cent and the sedentary subjects suffered a loss of 23.4 per cent. It is interesting to note that though the younger sedentary Indians are younger than the nomadic younger Indians on the average 3.9 years and the older sedentary Indians are only 0.9 of a year younger on the average than the corresponding nomadics, still the young sedentary Indians stand closer to the nomadic Indians according to the measure of mental fatigue than do their older ethnic brothers. In this instance at least age does not seem to favor the latter.

TABLE 3

Showing results of comparison of per cents in first and last six minutes of work for nomadic and sedentary full-blood Indians using the first six minutes as a base

	NUMBER OF CASES	ATTEMPTS	ACCURATES
Young subjects:			
Nomadic	61	6.8% gain	8.0% gain
Sedentary	57	4.7% gain	13.4% loss
Older subjects:			
Nomadic	47	5.0% gain	0.3% gain
Sedentary	66	1.0% loss	23.4% loss

Elsewhere (2) we have discussed the nature of the work curves of whites, negroes and Indians in addition to the facts of fatigue as brought out by the method used above. This was for the purpose of determining statistically if there are really different racial work curves for the subjects studied; just a difference appearing between averages is not to be regarded as a significant difference in comparing group performances. One means of determining such differences is to measure the amount of overlapping of the distribution of one group over that of the other. This we have done here, having proceeded thus:

1. To tap the work curves at various points so as to find what per cent was done during the first six minutes of work, what was done during first fourteen or the first twenty-two minutes of work for younger and older subjects respectively, and what was done in the last six minutes of work.

2. To take the medians of the distributions from which these parts of the curve were derived and compare them to see if these indicate differences.

TABLE 4

Showing medians of per cents done at various times during total work period for nomadic and sedentary Indians

	FIRST 6 MINUTES		FIRST 14 MINUTES		LAST 6 MINUTES	
	Median attempted	Accurate	Median attempted	Accurate	Median attempted	Accurate
Younger subjects:						
Nomadic	20.5	10.3	48.3	49.5	22.5	20.3
Sedentary	23.8	24.5	50.7	52.5	22.3	18.6
Older subjects:						
Nomadic	14.4	14.0	51.4	53.0	15.2	14.8
Sedentary	15.2	16.8	51.5	55.5	15.1	13.9

3. To test the reliability of the differences by seeing what per cent of one group's measures attain and exceed the median of another.

An examination of table 4 will show the medians of performances for these three phases of the nomadic and sedentary Indians work curves. The medians will be seen to read thus: In attempts category for nomadic younger subjects, first six minutes, 20.5 per cent; for first half, 48.3 per cent; for last six minutes, 22.5 per cent. In this category for the sedentary younger subjects the medians are for first six minutes, 23.8

per cent; first half, 50.7 per cent and for last six minutes, 22.3 per cent. In the accurates category the younger subjects of nomadic group show for the same phases of the curves respecttively as above indicated, the medians, 19.3, 49.5, and 20.3 per cent, and the younger subjects of sedentary group show for these same phases respectively, 24.5, 52.5, and 18.6 per cent. That is to say on a basis of comparison of medians alone of these three phases of the two Indian work curves the fact is indicated that the nomadic full-bloods tend:

1. To be more deliberate at start than the sedentary full-bloods, doing a smaller per cent of their work at the start of the game.

2. To show that by the time one-half of the total work period of twenty-eight minutes is up they have not done in either performance category quite one-half of their work but will do more than half of it in the latter half of the total work period; whereas the sedentary Indians are, in both categories, consistently inclined to do more than half of their work, i.e., they are more in a hurry to get through with the task.

3. To show that at the end the nomadic Indians are inclined to do a larger per cent in either category than at the start, whereas the sedentary sub-group tends to do less at the end than at the start and a smaller per cent of its total work in either category than did the nomadic sub-group.

For the older sub-groups we have just about the same situation, but especially is it more emphatic in the case of the accurates category. Here the nomadics tend to go about their work less speedily and more cautiously while the sedentary Indians are rather "excessive" as compared with the nomads in their efforts at the start, but less so in attempts than in accurates. By the middle of the total working period, i.e., here in the first twenty-two minutes of work, the sedentary Indians incline to do a larger per cent of their work than the others in the accurates category, but hardly much more in the attempts. At the end the status is the other way round, being still more emphatic in the accurates category, for the nomads do a larger per cent at the end than do the sedentary subjects, i.e., they are less "fatigued" as objectively determined.

TABLE 5

Showing per cent of sedentary sub-groups attaining and exceeding median of respective nomadic sub-group

	FIRST 6 MINUTES		FIRST 14 MINUTES		LAST 6 MINUTES	
	Attempted	Accurate	Attempted	Accurate	Attempted	Accurate
Younger subjects:						
Overlap, per cent..........	65.5	66.7	65.6	71.9	51.7	40.3
Older subjects:						
Overlap, per cent..........	62.0	75.8	57.5	66.7	53.3	40.9

Table 5 affords measures of the amount of overlapping which are given in order to obtain evidence of significant differences between the racial groups. As already indicated by the comparison of medians of per cents done there are apparent differences. We have found the nomadics consistently excelling the sedentary Indians in both performance categories and for both younger and older subjects. But the crucial test of differences is to see if the per cents of measures of sedentary Indians wherever we tap the curve tend to attain and exceed the medians of the measures of the nomadic performance in any significant degree. A per cent as measuring the amount of overlapping which departs very far from 50 per cent is more significant the farther above or below that per cent it goes. By referring to the table it will be seen that for work of first six minutes in younger racial groups these measures of overlapping are for attempts, 65.5 per cent and accurates, 66.7 per cent. For older subjects they are respectively 62.0 and 75.8 per cent. So we can say that at the beginning of the curves the differences are significant. At the half-way point, or thereabouts,

TABLE 6

Showing total columns added for the nomadic and sedentary Indians

	ATTEMPTS			ACCURATES		
	Average	A.D.	P.E.	Average	A.D.	P.E.
Younger subjects:						
Nomadic	50.9	15.2	1.7	29.0	13.4	1.5
Sedentary	45.0	12.1	1.5	22.9	11.2	1.4
Older subjects:						
Nomadic	118.0	22.8	2.8	64.1	18.4	3.4
Sedentary	107.8	29.4	2.4	60.8	19.3	3.1

TABLE 7

Showing classification of introspections of the subjects taken at the end of the experiment

	YOUNGER SUBJECTS		OLDER SUBJECTS	
	Number	Per cent	Number	Per cent
For nomadic Indians:				
Number reporting:				
"Not tired"	26	44	20	42
"Little tired"	25	43	25	52
"Tired"	0	0	2	4
"Very tired"	5	9	1	2
No report	3	4	0	0
For sedentary Indians:				
Number reporting:				
"Not tired"	30	53	36	55
"Little tired"	16	28	22	33
"Tired"	4	7	2	3
"Very tired"	7	12	6	9
No report	0	0	0	0

the measures are somewhat less significant, being for attempts and accurates 65.5 and 71.9 per cent respectively for younger sub-groups and 57.5 and 66.7 per cent for the older sub-groups. The measures at the close of the work, last six minutes, are all significant and in the same direction for both sub-groups in accurates only. For accurates the measures are 40.3 and 40.9 *per cent for young and old sub-groups respectively*, but for attempts they are 51.7 and 53.3 per cent respectively. However, if in respect to attempts the measures of overlapping *do not indicate significant differences*, they must indicate more or less similarity of behavior at the ends of the work periods. And this is just what was found when we examined the curves of work in attempts at the end. (See figs. 1 and 2.)

As to the feelings of fatigue reported by these inexperienced and untutored subjects we may look into this by examining table 7 which shows how the reports of these subjects stand in the matter. Here they undertook to say whether they were "not tired," a "little tired," "tired," or "very tired." Some failed to report at all. It will be seen that though of the young and old sub-groups of sedentary Indians 53 and 55 per cent respectively reported that they were not tired and all the rest reported that they were either a "little tired," "tired," or "very tired," and that in this respect they were more optimistic than the nomadic Indians of whom the younger sub-group reported 44 per cent "not tired" and the older sub-group 42 per cent "not tired" and all the rest a "little tired," "tired," or "very tired," the *objective* results as indicated by the various curves show that they "fatigued" more than the nomadic Indians in fact. This might indicate that the nomadic Indians *are more heroic in the face of felt fatigue* than were the sedentary Indians for they kept up their performance at least in accurate work more efficiently than did the latter.

By referring to table 6 which is really not a part of the study excepting that it is a useful sidelight it will be seen that the total performance of the nomadics is better for the total work periods than for the sedentary Indians because they added more columns and got more of them right.

SUMMARY

1. In the total columns added either attempted or accurately done the nomadic Indians excelled the sedentary Indians.

2. The sedentary Indians are more given to initial spurts than are the nomadic individuals.

3. The nomadic blood groups are inclined to resist fatigue more successfully than the sedentary blood groups.

4. At the end the sedentary blood groups tend to fall away more than the nomadic groups, but more in accurate performance than in attempted performance.

5. The sedentary subjects were not inclined to acknowledge feelings of fatigue as freely as did the nomadics though they "fatigued" more than the latter.

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THE RELATION BETWEEN PERSONALITY AND CHARACTER TRAITS AND INTELLIGENCE

A Study of a Group of Student Nurses

MARY GOODYEAR EARLE

An attempt has been made in the present study of two hundred and twelve student nurses in seven large hospitals in New York City, to discover if there is a correlation between their general intelligence and their personality and character traits, as exemplified by the so-called "ideal nurse."

Obviously a positive degree of correlation would be an exceedingly desirable finding. Inasmuch as certain personality and character qualities are an absolutely indispensable part of a fine trained nurse it would be worth while in demanding more than "average intelligence" to have some assurance that we were getting the other as well. We now have fairly satisfactory objective measures of intelligence with ever increasing progress along this line, and thus far, no satisfactory measures of personality and character traits. I am aware that there are members of the community who would dispute the assumption that more than "average intelligence" is required in a trained nurse, but those of us thoroughly familiar with this professional problem know that a high standard of nursing care is dependent in a large measure upon the intelligence and judgment of the student nurses who give it, plus the requisite personality and character qualities. Here one draws a sharp distinction between trained nurses and those who "wait upon the sick." The highly trained nurse might so to speak, be called the doctor's surrogate.

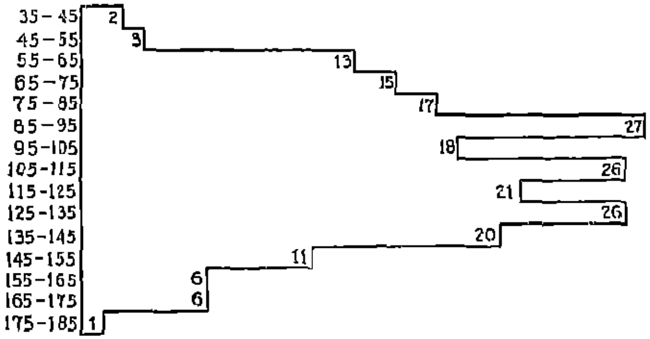
The field of the hospital training school for nurses is unplowed and virgin soil for psychological study in general and worthy of the best efforts and most creative thinking of psychologists along several lines. The adequate education and training of the student nurse has at last become a subject of discussion and interest to the public at large and with the establishment of Nursing and Health Departments in several universities of the country, it is rapidly becoming a subject of importance with those of us especially concerned in the education of women along lines of increasing usefulness and service. It is of special significance that Dr. David Snedden, the Educational Sociologist, considers it one of the most interesting and desirable of the professions into which young women can enter!

Since the publication of the Rockefeller Foundation Report on the whole field of nursing education in this country, less may be said in future by an uninformed press and public on the "over training" and over education of the student nurse, as it is agreed by the Foundation "that the standards are none too high for the important and responsible work nurses are doing." "In the public interest, these standards should be maintained and strengthened.

Concerning an analysis of the student nurse groups tested in this study, as superintendents of training schools for nurses, in common with many of us, have a conservative attitude toward the new and to them unknown, it was necessary in gaining permission to give a psychological test to a group of their students, to accept with alacrity the groups offered by them. In two instances probationers only were suggested as subjects and gladly accepted; though one had hoped to be given students who had been longer in the training schools, in order to be assured of that "intimacy of acquaintance," when the personality and character blanks were filled out. The size of the group was also a matter of the convenience and wishes of the superintendents, and so the seven groups offered here vary in number from twenty-four to thirty-nine.

To ascertain the general intelligence of the students, the Army Alpha Group Intelligence Test was chosen, Form 9, and given to the seven groups in the usual way. The testing was done on Alpha in February and March of 1922. This test has since become so well known in the population at large that there is some reason to believe that it may not be as reliable as it was formerly considered. At all events in later work with Alpha, some testers tend to get an undue proportion of high scores with nursing groups.

The test blanks were corrected and graded from A to D in the manner used in the Army, the letter grades being later transposed into numbers from 1 to 7. The results of this testing are highly gratifying and make an even more favorable showing than the tests of army nurses reported on page 829 of Volume 15 of the "Memoirs of the National Academy of Science" on "Psychological Examining in the United States Army." In the list of occupations on that page the middle fifty per cent of army nurses ranked next to the highest in the C plus group. The median for this group falls at 25 per cent below the lowest B grade. In the present study the median of 110, falls slightly above the lowest B score. It is to be expected that the group under discussion in this paper would test somewhat higher. A graph is given here for the group tested as a whole. It would indicate the desirability of a more rigorous exclusion at the lower end of the scale in order that the individual groups may be more homogeneous, particularly for teaching purposes. One might well consider eliminating



Graph of Army Alpha Scores Made by Student Nurses in Schools of Nursing in New York City those making an Alpha grade of below 75, provided of course, that the results in this test were corroborated by other objective, and subjective measures as reliable. Thus some of the difficulties in the training and curriculum might be simplified.

A few statistical figures follow on the results of the intelligence testing aspect of the study:

mean	113.3 (N = 212)	Median	110 (N = 212)
S.D.	29.8	P.E.$_{median}$	1.75
P.E.$_{mean}$	1.37	Q	22.04
P.E.$_{s.d.}$	.98	P.E.$_{Q}$	1.09
		Q^1	86.53
		Q^3	132.41

The present study of the intelligence of a small group of student nurses raises an interesting question as to the general level of intelligence found among student nurses in the training schools of the country.[1] Little has been done upon the testing of these young women; here and there an up-to-date superintendent of nurses is awakening to the idea that this is a tangible way of finding out something she very much wants to know; but for the most part the old fashioned and expensive "trial and error" method prevails. This usually means three to six months probationary nursing of the sick in the hospital wards, and of class instruction in both theoretical and practical work; except in the few better hospitals where the so-called preliminary course has been instituted. This course consists of a limited number of hours spent upon the wards with more or less cramming of theoretical and practical instruction, which the young nurse badly needs to prepare her for the more intelligent care of her patients. This might be considered an even more expensive method, as the time and cost of this instruction is thrown away when some of the students are discovered to be unfitted for the work. Since intelligence is so important a factor in complex habit formation as well as in education, it would seem that group intelligence tests used in the early probationary days of the students, as a routine measure, would help much in the elimination of the lower types of intelligence, thus saving time, effort and money.

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[1] Since this manuscript was written the writer has tested 2450 student nurses from the Atlantic to the Pacific, in 67 hospitals, in 26 cities and 15 states. The study represents an approximate 5 per cent sampling from five types of hospitals, taken, for the most part from the concentration of nurses in the larger localities. The Otis S. A. higher examination has been used with the entire group.

The personality and character traits rated in this piece of work were investigated according to the suggestions in Professor Rugg's series of articles in the Journal of Educational Psychology for November and December 1921, and January and February 1922, entitled "Is the Rating of Human Character Possible?" The qualities contributing to the ideal trained nurse were analyzed under nine headings as follows:

1. Conscientious
2. Self controlled
3. Tactful with patients
4. Kindly spirit
5. Cheerful quiet manner
6. Pleasing voice
7. Skill in nursing procedure
8. Team work
9. Executive ability

and subjected to the criticism of a few nursing executives and supervisors. A letter rating A, B, C plus, C, C−, D, D−, according to the Alpha scale was given for each quality, these in turn being transposed into the numbers from 1 to 7 in order to get the rank correlation between this subjective estimate and the Alpha test. Three judges from each hospital were chosen to rate their own students, these judges consisting of the training school superintendent and two supervisors, one usually being the assistant superintendent, the other the instructor in nursing procedures. The judgment of the superintendent of nurses might almost be considered a composite as she tends to hear what all supervisors think of the student. The instructor is in the habit of following up the work of the student nurses on the wards. Head nurses in charge of wards were not chosen as judges because in many cases they would not have had under them each member of the group. The minimum of three judges was secured except in the single instance of Hospital F. Unfortunately it was impractical to use the objective "scale-man" and so the subjective method of rating was adopted. An average was taken of the nine qualities and then of the opinions of the three judges. The single rating figure obtained from the nine qualities by the three judges was correlated with the grade obtained in the Army test by the familiar "rank method" using the seven individual hospital groups. These judges were highly competent to rate the students on the nine counts, nor was there "lack of acquaintance" with them except in the two probationary groups where only a two month's acquaintance existed. They had been instructed not to confer with one another, and in most instances these rating sheets were filled out by the three judges in the presence of the writer.

The results obtained have been inconclusive from either the positive or the negative standpoint. Averaging the correlations of the seven groups gives a ρ of 0.03 practically a chance correspondence. On analyzing the separate correlations which read as follows:

	ρ	N
Hospital A	−0.07	25
Hospital B	0.12	25
Hospital C	0.55	39
Hospital D	−0.23	37
Hospital E	0.21	28
Hospital F	−0.30	24
Hospital G	−0.04	34

it will be noticed that there is a wide variation in these seven groups from −0.30 to +0.55, the latter being high enough to have some significance with a P.E. of 0.07. But these figures really require interpretation and criticism, emphasizing the unreliability of the character of subjective judgments of human traits and, that the ρ's are obtained between a subjective and an objective measure. It is the subjective aspect of the study which is especially open to criticism.

In the first place, examining the personality and character ratings by the twenty-one judges as a whole, three for each group of seven, although the headings meant something very definite to this group of professional nurses, they tended not to use the entire scale from A to D−. In the second place there was a marked tendency to give a student a single letter rating for all nine qualities: in one case for instance, a judge who did use the entire scale, gave a student a single letter rating of D, for all nine qualifications and in view of the diversity of these headings this might appear to be a biased judgment. Another judge gave this same student a rating ranging from A to C, there were two A's, three B's, and four C's; while the third judge rated her B and C with one D and that, in executive ability. Obviously the ratings on this student differ too much to be reliable. The young woman as a matter of further interest made the low grade of 71 on her intelligence test, which places her in the C group and gave her a position of 32, 34 being the total number tested in this hospital. Is it possible that her mental dullness, suspected by the superindentent who rated her D in personality and character traits, over-shadowed her other qualities? To quote from Dr. Rugg "The suggestion comes insistently, however, that one of the most potent influences working against accurate estimates of character is the prevalence of just such general attitudes toward our associates and subordinates." Superintendents of large training schools for nurses often (I use this modifier advisedly) recognize and value general intelligence, for they sometimes suffer keenly from the want of it among their students. In the third place there was a marked tendency among some judges to rate very high, there were too many "A's," for instance. This may have been due to pride on the supervisor's part in the particular training school; the training school superintendents themselves were for the most part entirely free from this fault in their individual judgments of students, the supervisors more readily falling a prey to it. Lastly in a few instances the records were not complete for three judges. Some of the students were unknown to some of the judges though the judges knowing the largest proportion of students were chosen to make the judgments.

As to criticism of the individual hospital groups the four minus quantities as well as the two low positive correlations, 0.21 and 0.12, may be questioned at several points, some of which have been mentioned in the criticisms for the whole group. In Hospital F the rating of two judges only were used, as it was necessary to discard the third rating (by a nun) because she had used a single A rating for all the students. Judge A rated them too high, in fact the record was almost worthless because of this fact. In Hospital G half of the students were unknown to Judge A and this Judge gave a single letter grade for nine qualities on those she did rate. In Hospital A, Judge B rates too high, mostly "A's," and she does not use the entire scale; only twice does she give a rating of C. Judge C tended to use a single letter rating for all qualities and Judge A gave no mark below C plus. In Hospital D, Judge A gave too many high marks; Judge B failed to rate nearly half of the group. In Hospital B, Judge A gave too many high marks. In Hospital E the group tested were probationers and the data on some of the traits was not complete. The judges as a whole tended to rate their students too high. This leaves one Hospital, C, which seems to have been fairly free from the foregoing ce rticisms. In this case three competent judges rated all the students on each of the nine qualities. The entire scale was used by them and only one tended to rate high, this Judge also using in many instances, a single letter grade for nine qualities. In a number of cases there is a close degree of correspondence in the rating of the three judges indicating the reliable character of their judgments.

One further point may be of interest, the discrimination of intelligence by the judges in the few cases in this study in which it was done corroborates Professor Rugg's experience in this direction. For example, a student making a grade of A with a score of 166, is estimated as having a D grade of intelligence by Judge B, the superintendent of the training school. Another, with an A grade, and a score of 141 is also rated D; a third and fourth, making A scores of 150 and 143 are rated

A and B respectively. A second superintendent and a supervisor rate four A students as follows:

STUDENT	SCORE	SUPERINTENDENT'S RATING	SUPERVISOR'S RATING
1	140	A	A
2	148	C	C
3	145	B	B
4	136	B	B

Why do both judges fail to suspect the superior intelligence of No. 2, and both recognize it in No. 1 who makes only one point higher? Here we have the "direct comparisons of judgments of a trait and the objective measurement of it in the case of intelligence." Professor Rugg says of his Army study in this connection, "Taken as a group, officers of outstanding superior intelligence discriminate intelligence in others little better than do those of "average intelligence."

CONCLUSIONS

1. That, as the measurement of intelligence used in this test has been well standardized and is fairly reliable as a group test of intelligence one feels well satisfied with the results of this objective measure.

2. That, with reference to the subjective aspect of the study, had it been practicable to return later to these twenty-one judges for re-judgment on these students, the second group of results averaged with the first would doubtless have increased the reliability of many of the judgments.

3. That, considering the criticisms made above of the four negative correlations and the two low positive ones, we should be cautious in concluding from this study at least that only a chance relationship exists between personality and character traits and intelligence, on the contrary, in spite of the findings the indications may be in the other direction.

4. That, further work along this special line would, in all probability, amply repay the effort, particularly if sufficient data were collected so that suitable selection could be made of it.

THE NEGRO CHILD'S INDEX OF MORE SOCIAL PARTICIPATION

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Numerous investigations have yielded results which show rather conclusively that negro children do less well than white children in tasks which involve abstract intelligence (1). Peterson has suggested that certain traits worthy of note may be stronger in negro than in white children. Peterson (2) mentions specifically "freedom from tension" and "ease of bearing in social situations:"

> In a positive way the negro probably has certain traits worthy of note which are stronger than those in the white man. These have unfortunately not received as much attention as the deficiencies. It is probable that the negro has greater freedom from tension and from concern about remote conditions with an ease of bearing in social situations that is due to something more than a lack of realization of remote relations.

Lack of an adequate technique heretofore has militated against objective measurement of the traits mentioned by Peterson. Too, there have been many speculations and few objective measurements of racial differences in other traits of character. Pintner (3) cautiously refrains from speculating about racial differences in social or emotional traits:

> While we cannot conclude dogmatically that there are no qualitative differences between the two races, we may at least say that any marked qualitative difference in intelligence, as measured by the tests under consideration, does not seem to exist. In saying this we must remember that we are restricting ourselves entirely to the type of intelligence which is tested most effectively by the Binet and customary group tests. Mechanical intelligence has been much less effectively measured and social intelligence practically not at all. Furthermore we must remember that we have not raised the question as to emotional and moral differences between the two races. Popular opinion assumes large

> differences in these traits. There are no scientific measures of these as yet, and speculation about possible differences in this regard does not belong in a book devoted to intelligence testing.

The inferiority of the negro in tasks involving abstract intelligence has been demonstrated by various workers in quantitative psychology. It must be remembered that the tests used in most cases have been the group or individual intelligence examinations in which reading or language mastery plays an important part. There is some evidence that negro children fall below the standing of white children in mental ability when the task employed is of the performance type and the language handicap is partially eliminated.

Hollingworth (4) asks, "What does quantitative psychology teach with respect to the combination of performances in a given personality?" She concludes, "It will be seen that there is no law of compensation in human ability, however much we may long to find it there."

Again Hollingworth (5) states:

> There is found to be a quality of the individual which results in generally superior, mediocre, or inferior performance in his case . . . . a *positive coherence in the amounts of all traits possessed* extending even to appreciable coherence between physical and mental.

Decision in reference to compensation or correlation of desirable traits must be reserved until definitions of "desirable" and "undesirable" have been formulated and agreed upon.

Popular opinion assumes that a given trait is either desirable or undesirable. It may be that the degree to which an individual manifests a given trait is the best criterion of the desirability of that trait. Practical observation seems to indicate that moderation is desirable in most activities. For example, over-cautiousness may prove as undesirable as under-cautiousness. Sociability is often assumed to be a desirable trait. Common sense would seem to support the following proposition (6):

> It is necessary for a child to mingle with other children in order to learn how to get along with other people, but a child also has a right to

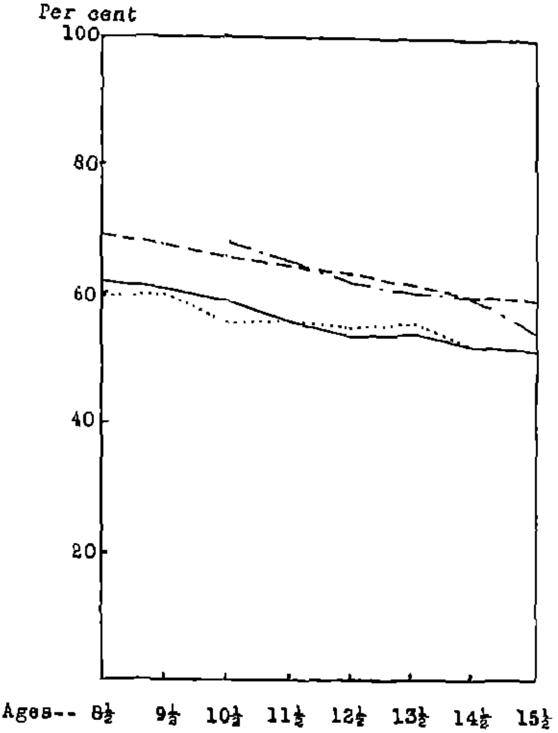
be alone a part of the time so that his individuality may have a chance to develop.

Lack of an adequate technique heretofore has militated against measurement of the extent to which a given child mingles with other children. Obviously there is need to account for the child's social contacts. Deviation from normal in respect to social participation will be intelligible to the student of education only when it is measured quantitatively. Qualitative expression of deviation is no longer satisfactory. The writers have attempted to state quantitatively the extent to which white and negro children differ in social participation. The following paper reports a study of the extent to which white children and negro children respectively participate with other children in their play activities.

METHOD

The Lehman Play Quiz was administered to more than 6,000 children in grades III to XII in the public schools of Kansas City, Missouri. The Play Quiz is devised for children in grades III to XII. The children are asked to indicate among a comprehensive and catholic list of 200 activities *only those* in which they have engaged *during the preceding week*. The children are later asked to designate the activities in which they participated *alone*. These activities in which children engage without companionship will be designated solitary activities when alluded to in the discussion following.

Included in the study were pupils from the following schools: Benton, Faxon, Franklin, Horace Mann, Humbolt, S. B. Ladd, Central Junior High, Northeast Senior High, Attucks, W. W. Yates, and Wendel Phillips. The last three schools of the preceding list are attended by negro children only. In order that environmental differences might also be taken into account the Quiz was administered to the pupils of certain one-teacher, rural schools in Douglass, Franklin, and Shawnee counties (Kansas). Small rural schools were selected for the study in order that a genuinely rural environment might be obtained for the study. The rural schools were attended by white children



MEAN INDICES OF SOCIAL PARTICIPATION FOR FOUR GROUPS OF CHILDREN

Negro children, Tulsa, Oklahoma............ — - — - — -
Negro children, Kansas City, Missouri...... — — — — —

White children, Kansas City, Missouri...... ————————
White children, (*Kansas rural*)............. - - - - - - - - -

only. The number of children of each group for each age-level from 8½ to 15½ inclusive may be seen by reference to table 1.[1]

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[1] The Tulsa children included in table 1 were given the Play Quiz by Mrs. Thelma Hill Anderson, a graduate student of The School of Education of The University of Kansas. Mrs. Anderson administered the Play Quiz to Tulsa pupils in order to procure data for a Master's thesis. Acknowledgement is herewith made for the use of these data.

For each child the total number of play activities engaged in during the preceding week was ascertained. The number participated in with one or more additional children was next determined. The per cent of the total activities that the social activities represented was designated the index of social partici-

TABLE 1

Number of children included in the present study

CHRONOLOGICAL AGE	RURAL WHITE CHILDREN	KANSAS CITY, MO., WHITE CHILDREN	KANSAS CITY, MO., NEGRO CHILDREN	TULSA, OKLA., NEGRO CHILDREN	TOTAL CHILDREN
8½	75	356	108		539
9½	94	543	173		810
10½	120	574	201	24	919
11½	129	608	226	49	992
12½	148	706	196	65	1,115
13½	128	758	156	87	1,129
14½	86	672	95	112	965
15½		747	55	109	911
16½				72	72
17½				25	25
Grand total					7,477

TABLE 2

Mean indices of social participation for each of four groups of children

CHRONOLOGICAL AGE	NEGRO CHILDREN, TULSA, OKLA.	NEGRO CHILDREN, KANSAS CITY, MO.	WHITE CHILDREN, KANSAS CITY, MO.	WHITE CHILDREN, RURAL (KANSAS)
8½	*	68.4	61.8	59.3
9½	*	67.4	60.6	59.9
10½	68.3	65.5	58.9	55.1
11½	65.3	64.5	56.1	55.0
12½	62.4	63.0	53.7	54.4
13½	60.5	61.9	54.4	55.5
14½	60.2	59.0	52.1	52.5
15½	54.8	59.5	51.4	*

* Data lacking.

pation. Thus, an index of social participation of 80 indicates that 80 per cent of the activities engaged in by the child were ones in which one or more additional children also took part. By this method of reckoning a high index of social participation signifies that the child is relatively social in his play behavior. Conversely, a low index of social participation means that the child is relatively solitary in his play.

TABLE 3

Percentages of negro children whose indices of social participation reach or exceed the medians of white children at each age-level

CHRONOLOGICAL AGE							
8½	9½	10½	11½	12½	13½	14½	15½
68%	63%	61%	67%	68%	63%	65%	64%

RESULTS

Table 2, shows the mean index of social participation for the four groups of children. It will be noted from table 2, that the negro children are distinctly more social in their play than either of the white groups.

Table 3, shows the percentages of negro children whose indices of social participation reach or exceed the median of the white children of corresponding C.A.'s. In table 3, comparison is made of two groups only, namely, the negro children of Kansas City, Missouri, are compared with white children of the same city.

Particularly salient is the fact that in every age interval (8½ to 15¼) negro children are more social in their play than white children. The differences are *marked and consistent* from year to year. From the data it is apparent that a conspicuous difference exists between the races in social participation.

REMARKS

Speculation regarding these data is interesting. There appears to be no means of ascertaining whether the extreme sociability of the negro child is a cause or a result of other racial characteristics. How much social participation is consonant with well-balanced development is unknown. It is entirely possible that over-participation in social activities may result in neglect of certain individual activities essential to well-balanced development. It is therefore impossible to say whether the negro child's excessive sociability is a handicap or an asset.

In a previous study the writers showed that children of low progress quotients are considerably more social in their play behavior than are children who make normal progress in school (7). It was pointed out also that gifted children (I.Q. 140 or above) are less social than are unselected children (8). In an unpublished master's thesis in which a study was made of two groups of negro children, one group consisting of children having high indices of social participation, the other consisting of children having very low indices of social participation, it was found that the more solitary group was much superior to the extremely social group in scholarship (9).

These data indicate that an excessively high index of social participation is likely to coexist with inferior scholarship. Whether much social participation posits also "freedom from tension" and "ease of bearing in social situations" are matters of speculation.

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MENTAL DIFFERENCES IN CHILDREN REFERRED TO A PSYCHOLOGICAL CLINIC

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The problems confronting a psychological clinic are, for the most part, of a very practical nature demanding immediate attention and at least some gesture of solution. How intimately the clinician is concerned with the people of Moronia can never be guessed from a statistical table! Yet from events of such psychological significance as Mr. Guerrero's earnest attempt to provide for a family of fourteen by turning from casual labor to the more lucrative establishment of a mission at his home, the psychologist must turn to take account of her group of Guerreros and Canonzzaros and their like.

It is a group made up very largely of South Europeans who have drifted to California from Italy and Portugal, some by way of the Azores, and have been making their living by seasonal labor in the prune and apricot orchards of the Santa Clara Valley. The Psychological Clinic of the Santa Clara County Health Center, established as part of the Stanford University Psychological Clinic,[1] offers psychological analysis of individual cases followed by a plan of treatment based upon such clinical findings. The children referred to the clinic include some presenting behavior problems in school, some who have come to the attention of local physicians, and some who have been brought before the court for commitment to institutions. Parents, too, have learned to bring their children to the clinic for advice on mental hygiene.

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[1] The writer has for a number of years conducted another clinic in connection with the Juvenile Court of Santa Clara County. A report of the mental characteristics of this group appeared in Vol. x, 2, of the Journal of Delinquency, March, 1926.

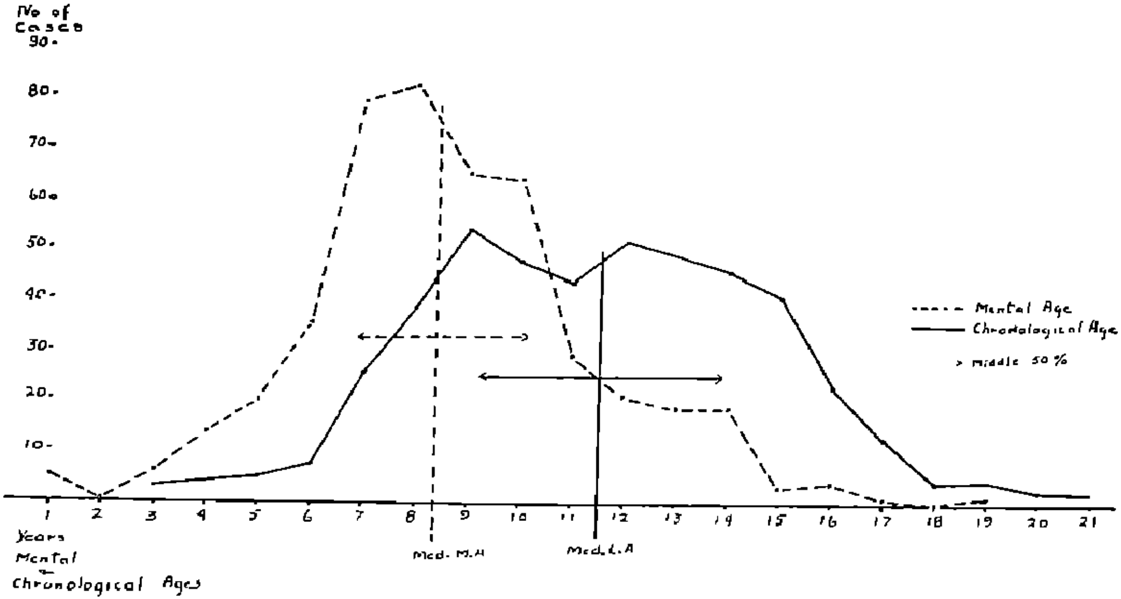

FIG. 1. DISTRIBUTION OF CLINIC CASES BY MENTAL AND CHRONOLOGICAL AGES

The Health Center has a social worker who serves the mental clinic by getting family and social history data and by a certain amount of follow-up work. The psychologist, a member of the Stanford University faculty, holds clinic one day a week at the County Health Center. The psychologist is assisted by qualified graduate students from the Stanford psychology department. Without the services of the social worker, the psychological work would be clinically futile. The social service department bears about the same relation to the psychological clinic that the effector system of muscles and glands bears to the central nervous system of the body.

The cases referred to the Psychological Clinic range in age from 3 to 21 years while the mental age scores range from 1 to 19 years. In intelligence quotient the range is from 10 to 130. The typical child referred to the Clinic is about eleven and half years of age and has the mental development of a child of eight. (Median chronological age is 11.6 and the median mental age 8.4.) The middle 50 per cent of the cases fall between ages 9.3 and 13.9 with mental ages between 6.9 and 10.2. The median I.Q. of the group is 77.1 with the interquartile range falling between 64.8 and 91.6. These distributions, shown in figure 1, serve to delimit the group with respect to mental level. The following classification[2] according to mental status shows:

I.Q.	CLASSIFICATION	NUMBER	PER CENT
10–24	Idiot	6	1.3
25–49	Imbecile	33	7.1
50–69	Moron	118	25.3
70–89	Retarded	180	38.6
90–109	Average	101	21.5
110–130	Superior	29	6.2

In a group of unselected children only the lowest 2 per cent fall as low as the lowest 34 per cent of the clinic group and the range designated as average, that between 90 and 110, includes only 21.5 per cent of the clinic cases.

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[2] It will, of course, be understood that such a classification is purely arbitrary and is made only for convenience in grouping. Mental diagnosis is never made on such a basis.

NATIONALITY AND MENTAL LEVEL

Our children are mostly Latins whose parents have come from the South of Europe. By "Latins" we shall mean the South Italians, Portuguese, and Spanish-Mexicans. These Latins constitute 9.3 per cent of the population of Santa Clara County but they make up 54.0 per cent of the admissions to the Psychological Clinic. Twenty-one per cent of the population of the County is made up of foreign-born whites. Of these foreign-born whites, 29.2 per cent are Italians. Italians constitute 6.2 per cent of the total population of the County but 38.2 per cent of the Clinic admissions are Italians and 61.4

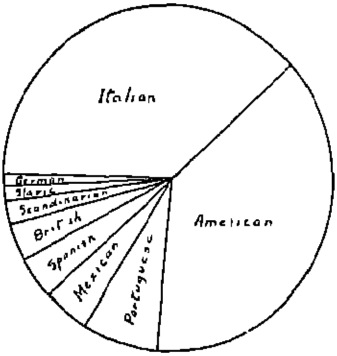

FIG. 2. PERCENTAGE DISTRIBUTION OF CLINIC CASES BY NATIONALITIES

	Per cent
Italian	38.2
American	37.9
Portuguese	7.4
Mexican	4.5
Spanish	3.9
British	3.0
Scandinavian	2.2
Slavic	1.3
German	1.0

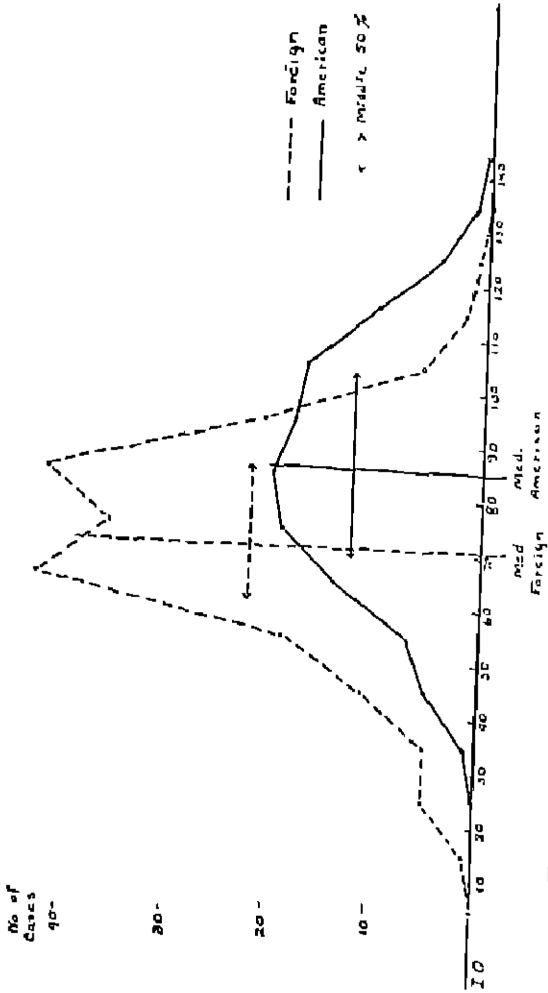

FIG. 3. DISTRIBUTION BY I. Q. OF FOREIGN AND AMERICAN GROUPS

per cent of the foreign-born parents of Clinic children are Italians. (These figures are based on a total population of 467 cases who have been given mental examinations.) Children have been classified according to the birth-place of parents. All but a negligible number of the children are American-born. Our "American" group includes many cases of South European stock only one generation removed from ancestors who knew no English and whose American-born parents, living in a "little Italy" in this country, are more familiar with Italian speech and ways than with those of their adopted country.

The median intelligence quotient of the group whose parents are American-born is 86.1 (P.E. 1.9) while that of the foreign-born is 71.7 (P.E. 1.1). The range of intelligence quotients of the American group is 33 to 130 while that of the foreign group is 17 to 122. The middle 50 per cent of the American group is between I.Q. 70.4 and 103.4; the middle 50 per cent of the foreign group is between I.Q. 61.3 and 86.3. Figure 2 shows these distributions for both American and foreign groups.

The mental inferiority of the foreign-born group and especially of the Italian group is outstanding.[3] That this inferiority is not due to a language handicap that causes this group to show such a marked retardation as measured by psychological tests seems clear from an analysis of the evidence. A similar group was examined by Dr. Kimball Young[4] with a view to the determination of the mental level of Latin immigrants in Santa Clara County. Dr. Young used, besides the verbal tests, other tests non-verbal in character designed to eliminate the language factor. He presents conclusive evidence to the effect that the inferiority revealed by the verbal tests is revealed equally clearly by the non-verbal tests. Dr.

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[3] It should be understood that the Latin population of Santa Clara County, especially the Italian and Portuguese, is not representative of the general level of intelligence of those nationalities found in the home country or in other sections of the United States.

[4] Kimball Young, Mental Differences in Certain Immigrant Groups. Univ. of Oregon Pub., I–II, July 1922.

Young concludes: "That the alleged language handicap does not in fact exist in the case of children of South European descent, to the great extent imagined. It serves as a handicap chiefly for those newly arrived in this country, but of these, those who have the capacity do acquire the tools rapidly and those who have not the capacity remain on a lower level of ability. That the true difficulty is one of mental capacity, or general intelligence, which makes the Latins unable to compete with children of North European ancestry. . . . ." Dr. Young states also that "If it be thought that the average I.Q. of the American group in its modal grade be 100, then the average I.Q. for the Latins would be near 83."

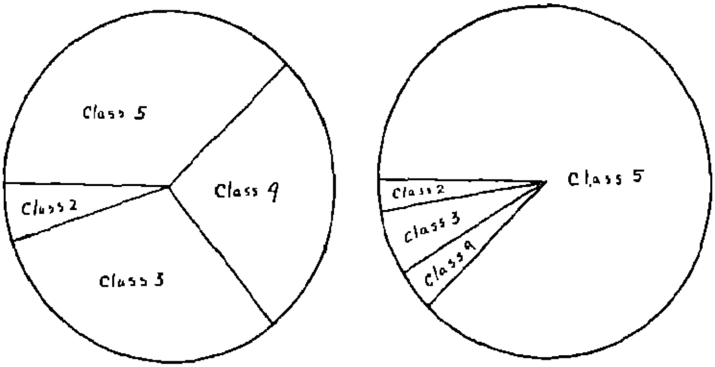

FIG. 4. PERCENTAGE DISTRIBUTION OF OCCUPATIONAL RATINGS ACCORDING TO TAUSSIG CLASSIFICATION

	AMERICAN per cent	ITALIAN per cent
Class 5	37.7	87.5
Class 4	26.4	3.9
Class 3	33.0	5.8
Class 2	2.8	2.9

If we examine the Clinic cases with this relationship in mind we find that the average I.Q. of the American group bears the same relationship to the average I.Q. of unselected American children (I.Q. 100) that the average I.Q. of the foreign-group bears to the average I.Q. which Dr. Young found for his group of unselected foreign cases in Santa Clara County, i.e. 100:83::86:72. That is to say the American group of Clinic cases is as much retarded with reference to the 100 I.Q. standard as the foreign group is with reference to the 83 I.Q. standard which was found to be the level of unselected Santa Clara

TABLE I

Distribution of I.Q.'s by nationality of parents

I.Q.	AMERICAN	ITALIAN	MEXICAN	PORTUGUESE	SPANISH	SCANDINAVIAN	BRITISH	SLAVIC	GERMAN	FOREIGN TOTAL
15–19									1	1
20–24				1						1
25–29		3	1							4
30–34	1			1	1					2
35–39		1					2			3
40–44	4	2		1		1				4
45–49	1	4	1	2						7
50–54	1	5	1	2		1				9
55–59	6	6		3	1					10
60–64	4	7	1	3	2		1		1	15
65–69	10	17	3	1	3	2	1	1		28
70–74	8	16		2	2		2			22
75–79	11	8	1	4		1				14
80–84	7	15		1		2				18
85–89	13	17	3	1	1		1	1		24
90–94	9	10	1		2					13
95–99	9	4	1	1			1	1		8
100–104	6	1						1		2
105–109	11	1	1				2			4
110–114	7									0
115–119	4	1							1	2
120–124	4						1			1
125–129										0
130–134	1									0
Total.......	117	118	14	23	12	7	11	4	3	192
Median.....	86.1	73.4	72.0	61.8	67.3	67.8	72.8			71.7

County children of Latin parentage. Table 1 shows the distribution of I.Q.'s by nationality of parents.

In a further attempt to analyse the data with regard to the mental status of the foreign group, a comparison was made between the I.Q.'s of older and younger children in the same family in the case of both American and foreign children. If the older foreign children proved to have higher I.Q.'s than younger children in the same family it might seem to indicate that further exposure to their educational environment was operating as a causal factor. In the American group 39 comparisons were possible between older and younger children in the same family; in the foreign-group 60 comparisons. (It will be recalled, of course, that the foreign group is made up of children of foreign-born parents; the children themselves were born in this country.) In the case of the American group the central tendency of change from younger to older children in the same family was 1.15 points decrease in I.Q. which means that the younger children in the family tended to have slightly higher I.Q.'s. In the foreign-born group the central tendency of change was 4.68 points decrease.. The middle 50 per cent of change is between 3.78 points increase and 18.33 decrease. This tendency cannot be explained on the assumption that the older children were not adequately measured by the scale, since the group is so retarded that it does not touch the upper end of the scale. Whatever the reason for this decrease in the foreign group at least it is perfectly clear that the I.Q. is not being increased in the case of the older children because of their longer contact with American schools. It is therefore highly probable that the mental retardation of the group is not due to a language handicap but to the innate mental inferiority of the group.

Table 2 shows the relationship between the number of children in a family and nationality. The figures indicate the number of families of each nationality having 1, 2, 3, etc., children. For 70 American families represented in the Clinic group the average number of children was 3.7 per family. Italians average 5.2 children per family and the Portuguese the largest number 6.0. There are, however, only 11 families represented in the Portuguese group and the average is brought up by one family with 12 children. The average number of children for Clinic families is 4.8. Of course, this figure is much too high for average families of the several nationalities in the community, because the Clinic families are selected in the first place by the fact of having children to be brought to a clinic. Then, too, the larger the family the more apt the family is to need assistance and thus to come to the attention of the Health Center. On the other hand, since the age of parents has not been taken into account we are not sure that these families represent fairly the size of Clinic families, because there is no evidence that the family is completed. The figures must be taken only at their face value as representing the present status of size of family for each nationality that is being served by the Psychological Clinic.

TABLE 2

Relationship between number of children in a family and nationality

NUMBER OF CHILDREN	AMERICAN	ITALIAN	PORTUGUESE	MEXICAN	ALL OTHERS	TOTAL
1	9	3	2			14
2	15	4	1	1		21
3	10	10	1	1	5	27
4	7	8			3	18
5	7	12	1	1	4	25
6	11	11	2	4	6	34
7	8	8	1		3	20
8	2	5	1		1	9
9	1	2	1			4
10		1				1
11		2				2
12			1			1
Total.....	70	66	11	7	22	176
Median...	3.7	5.2	6.0	5.6	5.3	4.8

THE SOCIAL-ECONOMIC STATUS

Since the Health Center admissions are made on the basis of the budget plan suggested by Professor Jaffa of the University of California, an objective criterion of economic status is available in the classifications made according to this plan. The Jaffa Budget is based on "the average of many dietary studies of families of small income and has been modified just enough to overcome undesirable deficiencies due to enforced privations and to meet the minimum demands for health and efficiency." For the purposes of the present study the budget is cited merely as an objective criterion of the economic status of the group. Its standard is the minimum of subsistence diet required and is a combination of the "theoretically worked out standard and that which is the people's instinctive choice modified by tradition, built up by generations of experience and limited by small income."[5]

The budget, modified from the Jaffa Budget, which is used as a basis for Clinic admissions is as follows:

Class E is not eligible.
Class D pays 50¢ a treatment and pays costs for drugs etc.
Class C pays 25¢ a treatment and pays ¾ of the cost of drugs.
Class B pays 10¢ a treatment and pays ½ of the cost of drugs.
Class A pays nothing for treatment and nothing for drugs.

Monthly Income

	CLASS E	CLASS D	CLASS C	CLASS B	CLASS A
For:					
Man....................	Over 75	65–75	55–65	45–55	Under 45
Woman................	Over 70	60–70	50–60	40–50	Under 40
Man, Woman, Baby...	Over 120	110–120	90–110	80–90	Under 80
Man, Woman, 3 children................	Over 150	140–150	130–140	120–130	Under 120
Man, Woman, 5 children................	Over 190	180–190	170–180	160–170	Under 160

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[5] In discussing its limitations, the maker of the budget quotes the suggestion of Professor Miller of Harvard that statisticians who get to Heaven be put to the task of determining how much milk and honey are

The occupation of parents was also considered as an index of social and economic status. Occupations have been grouped according to the Taussig classification. Taussig outlines five classes of vocations, chiefly on the basis of economic standing. Class V includes the unskilled day laborers; IV, the semi-skilled; III, the "aristocracy of the manual laboring class," the skilled workmen; II, the lower middle class ("the white-collared working class"); "here are clerks, bookkeepers, salesmen, small tradesmen, foremen, teachers of the lower grades," etc.; Class I, "the professionals, the business men, managers of industry, higher public officials, and the smaller propertied classes generally."

According to the Jaffa Budget classification no significant difference has been found between average I.Q.'s of children whose parents fall into Class A, B, C, or D. The median I.Q. for Class A is 72.7 with the middle 50 per cent of the cases between 51.9 and 94.1; the median I.Q. for Class B is 73.1 with the middle 50 per cent of the cases between 51.9 and 93.6; the median I.Q. for Class C is 72.9 with the middle 50 per cent of the cases between 52.5 and 93.7. Class D has not been considered because there are too few cases to make the averages of any significance. (Three cases fall into Class D.) But divide the groups into American and foreign and there appears to be a significant difference. For the American group the medians and middle 50 per cent are as follows:

	MED. I.Q.	P.E.	Q_1	Q_3	D	P.E.$_d$	RATIO
Class A..........	85.3	2.5	69.9	99.4	6.7 (A & B)	4.1	1.6
Class B..........	78.6	3.2	68.4	100.4	9.3 (A & C)	3.7	2.5
Class C..........	94.5	8.6	59.6	117.8			

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necessary to maintain an adult saint for ten thousand years. In the same vein of sardonic humor he might have suggested—perhaps after reading some text book on statistics—that such statisticians as do not get to Heaven be set the task of computing a minimum standard "for health and efficiency" for the people of Moronia who don't know how many pencils you can buy for fifty cents when two pencils cost five cents. For it is the people of Moronia who constitute the real problem of the Clinic.

Class B is inferior to Class A in mental status and Class C is superior to Class A in mental status. For the foreign group the differences are as follows:

	MED. I.Q.	P.E.	Q_1	Q_3	D	$P.E._d$	RATIO
Class A..........	69.6	1.7	59.3	83.2	4.9 (A & B)	2.3	2.1
Class B..........	74.4	1.6	64.5	87.4	1.7 (B & C)	2.8	0.6
Class C..........	72.8	2.3	64.3	85.2			

Here the difference between Class A and Class B is large enough to be significant but that between Class B and Class C is not a significant one.

It is clear that whatever differences there are between the Class A, Class B, and Class C groups are obscured by throwing the cases altogether without taking account of the nationality differences. The Americans in the Class C group are clearly of superior mental status and probably in need of temporary relief only. Analysis of the data shows this to be the situation in the majority of cases. It is not apparent why Class B should prove to be inferior in intelligence to Class A unless the explanation lies in the fact that widows are given this classification by virtue of the fact that they are widows, and deprived of a provider, whatever their economic standing within the range of the levels served by the Health Center. In the foreign group Class A is differentiated from the other two which are not significantly different from each other. Here Class A seems to include individuals of lower intellectual and, consequently, of lower economic standing.

Is there any relation between the intelligence of the children and the present occupational groupings of the parents? When grouped according to the Taussig classification a rough relationship seems to hold. By nationalities the percentages in each class are shown on page 483.

Here the Italians again appear to be inferior in occupational rating as well as in intelligence. The graphs show these percentages for both the Italian and American groups. Median

TAUSSIG	CLASS V	CLASS IV	CLASS III	CLASS II	TOTAL NUMBER OF CASES
American	37.7	26.4	33.0	2.8	106
Italian	87.5	3.9	5.8	2.9	103
Portuguese	73.3	6.7	20.0		15
Mexican	100.0				14
Spanish	100.0				12
Scandinavian	14.3		85.7		7
British	22.2	11.1	66.7		9
Jugo-Slavic	50.0		25.0	25.0	4
German	50.0	50.0			2

scores for each of the five classes show a distinct increase from lower to higher occupational ratings; Class V, I.Q. 71.8; Class IV, I.Q. 80.9; Class III, I.Q. 86.0. The number of cases in Class II is too few to be significant. There is a small positive correlation between I.Q. and Taussig classification ($r = 0.26$).

Young found, in the study mentioned above, that "the mean intelligence scores of the children whose parents were classified indicate that there is a rough relation between occupational status of the parents and the general intelligence of their offspring in the public schools. The mental tests show *some correlations with the occupational ratings. If not large,* these are at least indicative of a certain disposition of the occupational level to reflect the general ability of the families."

EDUCATIONAL LEVEL

Educationally the children, because they are older chronologically, have been pushed beyond the level of their intellectual capacity. We find the mentally retarded cases of our group advanced according to grade placement when the mental age is taken as the index of grade level at which the child will probably be able to function. Table 3 shows the relation of mental age to grade. Numbers to the left of the enclosed frequencies in this table indicate that the cases are retarded for their *mental age,* frequencies to the right of the cells indicate that cases are advanced for their *mental age.* For example, there are 48 cases with a mental age of 9. Of these 5 are retarded because they are only in the second grade, 13 are properly placed in the third grade according to their mental age, 13 are advanced one year for their mental age, 10 are advanced two years, 2 are advanced three years, and 5 mental nine-years-olds are trying to do the work of the 7th grade. The median mental age of the group is 8.7, but the median grade is between 3 and 4 (3.4). Of the total number of cases 59 or 20.8 per cent are properly placed according to their mental age; 48 or 17 per cent are retarded; and 176 or 62.2 per cent are advanced, that is they are trying to do work which is beyond their mental capacity. It is, of course, not to be expected that there will be a perfect correlation between mental age and grade placement. Other and different mental factors besides intelligence

TABLE 3

M.A.*	GRADE											
	1	2	3	4	5	6	7	8	9	10	11	Total
19											1	1
18												0
17							1					1
16					1			1		1		3
15					1			1				2
14					1	3	2	1	1	1		9
13					1	3	3	1	1			9
12					7	2	1	2	2			14
11			1	2	4	7	1	2				17
10		2	12	9	9	11	4					47
9		5	13	13	10	2	5					48
8	3	15	24	12	3							57
7	11	21	13	1	1							47
6	13	3	2	1								19
5	5	3										8
4	1											1
Total.......	33	49	65	38	38	28	17	8	4	2	1	283

* Mental Age 5 means 4–6 to 5–5.

enter into school success, such factors as conscientiousness, ability to fit into the social group, traits of personality and the like that make for social adjustment. But give a child or an adult tasks that are beyond his ability, confront him continually with social situations with which he is unable to cope, and sooner or later you will find him categorized somewhere in school, in the court, at your social agency, or at your clinic a "behavior problem." Mental inferiority is, in a large per cent of our cases, the original cause of the maladjustment.

CIVIL STATUS OF PARENTS

In order to determine how many of our cases came from broken homes, I have classified our children according to the civil status of parents. For the 316 cases for whom these data were available, I have found that 211 or 66.7 per cent of the cases came from homes where both parents are living. Here poverty and a low level of intelligence seem to have been the determining factors in the situation. Thirty-seven or 11.7 per cent have come from homes broken by the death of the father. In 18 cases, 5.7 per cent, the parents are separated. In 17 cases, 5.4 per cent, the mother is dead. Fourteen cases, 4.4 per cent, come from homes broken by reason of divorce. In 8 cases, 2.5 per cent, both mother and father are dead. In 7 cases, 2.2 per cent, the father has deserted the family. In 4 cases, 1.3 per cent, the mother has deserted.

SUMMARY

Of 467 cases referred to the Psychological Clinic of the Santa Clara County Health Center, 157 or 33.7 per cent fall below I.Q. 70, 180 or 38.6 per cent are mentally retarded, 101 or 21.5 per cent average, while only 29, 6.2 per cent, attain a mental level above I.Q. 110. The foreign group is more retarded than the American group and this inferiority seems to be due to native endowment rather than to inability to handle the language. Of the foreign group the Italians constitute the largest per cent; in proportion to the number of Italians in the county they exceed their quota of the Clinic group by about 30 per cent. In social and economic status as indicated by the Taussig classification into non-competing groups and the Jaffa Budget classification, the American and foreign groups each show a slight tendency towards positive correlation between economic status and intelligence. In general the lower the economic status the lower the level of intelligence. Educationally the group is retarded with respect to chronological age and advanced with respect to mental age. The retarded children of the group have been pushed beyond their mental capacity.

INTEREST AS AN INDICATION OF ABILITY

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A. INTRODUCTION

The possibility of the existence of a close relationship between interest and ability has stimulated a significant line of research during the past few years. If interest in "things," for example, is an indication of ability to work with things, the fact is of immense importance to the educational and vocational counsellor, and to the employment manager. The first aim of this investigation was to determine, for a group of college men, the relative proportions interested in (*a*) things, (*b*) people, and (*c*) ideas. The second aim was to discover, if possible, whether interest may be considered as an indication of ability.

The investigations within this field have been of four main types: (*a*). those dealing with interest and ability so far as school subjects are concerned, (*b*), those dealing with interest in *specific occupations* and ability as indicated by intelligence test scores, (*c*), those dealing with interest as a basis for rough vocational classification in order to determine, for example, whether a technical school graduate should choose sales or design engineering. In the fourth type of study, (*d*), an attempt has been made to classify interests into types, e.g., *humanics* or interest in people, and *mechanics* or interest in working with things. The neglected classification, interest in working with ideas, as exemplified by certain types of authorship, scientific research and invention, is considered in this paper.

B. REPRESENTATIVE STUDIES

The main points developed by these four types of investigations may be reviewed with profit. Thorndike reported in

1912 upon the problem of the permanence of interests and their relation to abilities. This original study, based upon 100 cases, was extended so that in 1917 a report on 344 cases was made. In each investigation the subjects estimated their order of interest, and order of ability, in the following subjects: mathematics, history, literature, science, music, drawing and "other hand work" which included carpentry, sewing, gardening, cooking, carving, etc. The estimates were for the last three years of the elementary school, the high school, and college. These studies led to the following conclusions.

> A correlation of 0.6 or 0.7 seems then to be approximately the true degree of resemblance between the relative degree of an interest in a child of from ten to fourteen and in the same person at twenty-one." (24: 453)
>
> "The individual whose interests follow his capacities least closely still shows a substantial resemblance (nearly 0.5). The correlation between an individual's order of subjects for interest and his order for ability is in fact one of the closest of any that are known. A person's relative interests are an extraordinarily accurate symptom of his relative capacities." (24: 455) An average correlation of 0.80 was reported. (23: 170)
>
> "Interests are also shown to be symptomatic, to a very great extent, of present and future capacity or ability. Either because one likes what he can do well, or because one gives zeal and effort to what he likes, or because interest and ability are both symptoms of some fundamental feature of the individual's original nature, or because of the combined action of all three of these factors, interest and ability are bound very closely together. The bond is so close that either may be used as a symptom for the other almost as well as for itself." (24: 456)

Bridges and Dollinger considered it "desirable to determine the correlation between interests, evaluated subjectively by rankings of courses, and abilities, measured objectively by grades obtained in these same courses." (2:309) The correlation between rank in interest and grade earned in Elementary Psychology was 0.22. The correlation between rank in interest and estimated rank in ability was 0.59. Comparable coefficients were reported for English. They concluded that:

> When ability is measured by a more objective means, namely, college grades, a very low correlation between interest and ability is obtained,

so low in fact that one might well be justified in the statement: A person's relative interests are an extraordinarily *in*accurate symptom of his relative capacities. It might also be inferred from data here presented that a person's estimate of his ability is an extraordinarily inaccurate symptom of his real ability, for the correlation between the students' rankings of their courses in ability and the grades obtained is only 0.28." (2: 313)

The original data of Bridges and Dollinger were placed at the disposal of Thorndike for the purpose of comparing "the position in which a college student puts one of the subjects which he is studying for interest to him in comparison with the other subjects which he is studying" and "the mark which he receives in that subject *in comparison with the marks which* HE *receives in other subjects.*" (25:374) In a group of 140 cases studied for this relationship, r had a central tendency of 0.46. For the same data, Thorndike stated that a correlation of 0.70 is obtained when an individual's ranking of subjects for interest is correlated with his ranking of them for his ability in them as he estimates it. He concluded that, "On the whole Bridges' data seem to corroborate the doctrine of a very close relation between the order of an individual's interests and the order of his abilities." (25:376)

Franklin (6) found a high degree of permanence in the vocational interests of Junior High School pupils over a period of a year. In connection with the present study, it is interesting to point out that he also found that pupils with clerical interests made higher scores in a prognostic clerical test than the unselected group.

In a report on "Intelligence and Interest in Vocational Adjustment," Fryer cited data on the occupational interests of 340 men who voluntarily sought advice. Using the Army Alpha as the measure of intelligence, he found "that 75 per cent of these subjects possess more intelligence than that required by their occupations, 9 per cent have the same as required, and 16 per cent have less intelligence than required by the occupation." (9:132) Those applying for advice were requested by the counsellor to indicate occupations that they desired to enter. "Fifty-eight per cent have more intelligence than required by the desired occupations; 10 per cent the same and 32 per cent have less than required by the occupation." (9:137) Using interest as the sole basis for classification, or vocational placement, led Fryer to conclude that not more than 50 per cent of the cases would be satisfactorily adjusted, so far as intelligence is concerned.

In reviewing the work of Proctor (19), Fryer stated, "Among adolescents, according to a study of 806 high school students, a still higher degree of vocational maladjustment would occur if the subjects were placed in their vocational ambition. $R = +0.21 \pm 0.02$, for intelligence requirement of the vocational interest and the ability as measured by the mental test." (9:145).

Feingold (5:153) reported on the vocational ambitions of 512 grammar school graduates. An analysis of his data indicates that 7 per cent have more intelligence than needed in the desired occupation; 46 per cent have the same intelligence, and 47 per cent have less intelligence than required. Fifty-four per cent would be maladjusted if placed solely on the basis of interest.

Various attempts have been made to measure interest objectively. Moore worked with sales and design-engineers, using a specially prepared interest analysis blank. He stated,

> "The use of the *Record of Interests* shows that men in different lines of work have different interests. The interests of a person are not in just one specific occupation, but they are general to the extent that they pertain to very similar or closely allied occupations or activities. Interest in a certain class of activities is a criterion that the person will be interested in any other very similar activity. By similar activity is meant one that requires much the same information, training, experience, kind of materials and tools worked with, mental activity, personality, ideals of accuracy and perfection, and social attitude." (16: 81)

Freyd arrived at practically the same conclusion when he compared the personalities of the socially and mechanically inclined. He stated,

> "The results of the group comparisons lead to the conclusion that those who are interested in dealing with human beings (the salesmen) are differentiated from the students of mechanics by greater social

> ability, credulity or suggestibility, adaptability, excitability, self-confidence, talkativeness, present-mindedness, and good nature. The students of mechanics show a greater tendency to be self-conscious, careful of details, inhibited and cautious, reticent, absent-minded, and glum. They are more capable of making fine coördinations, and excel in slow, painstaking, and accurate effort. There is no evidence for two corresponding sharply defined types of personality, but evidence points *to the utility of recognizing 'extremes,' those few at the social extreme possessing* all the traits of the *completely socially adapted person, and* those at the mechanical extreme possessing all of the traits of the person who is completely devoted to machines or inanimate objects." (8: v-vi)

Hartman and Dashiell (13) studied thirty-one juniors and seniors, using tests of the following types, (a) Word completion, (b) Code writing, (c) Immediate retention of visual impressions, (d) Arithmetic problems, (e) Pitching pennies, and (f) Letter cancellation. When the test program was completed, the subjects ranked the six exercises in order of their interest in them. A correlation of + 0.243 was found between ability, as measured by the tests, and the interest rankings. "As it was, twenty-five of the thirty-one subjects showed positive correlation; and the highest individual positive correlation found was 0.915, while the highest negative correlation was 0.371."

In an attempt to secure some definite, objective measure of interest, Burtt (3) studied a group of 43 agricultural engineering students. The men were given a series of 18 mental tests, designed to indicate both interest and ability. While not conclusive, the report is suggestive of the possibilities of the method of attack. McHale (15) devised an information test based on interests for the purpose of studying the vocational interests of college women. She reported a correlation of + 0.71 between the vocational test and success in Educational and Social Service; + 0.81 between the test and success in Business, and + 0.67 between the test and success in Science.

Cowdery modified the Carnegie Institute of Technology Interest Analysis Blank and measured the expressed attitudes of 34 doctors, 34 lawyers and 37 engineers. A scoring method, devised by Kelley, was employed which differentiated the subjects in terms of their vocational interests. Cowdery stated, the method "has proved its classificatory efficiency to be between 80 and 90 per cent, and the reliability of its scores to be from 0.77 to 0.90." (4:140)

Strong worked with 1271 records, representing 18 different occupational groups. Items were scored and weighted. In his first paper he shows how personnel managers may be distinguished, on the basis of their interests, from members of twelve other occupations. ". . . . only 3.5 per cent of nonpersonnel men rated A, i.e., as high as 75 per cent of personnel managers who scored highest on the interest test." (22:235) In his second paper, Strong reported on the interests of personnel men in thirteen other occupations. He stated, "It is very significant that men in these twelve occupations are apt to have the interests of a personnel manager in just about the ratio that personnel managers have interest in their occupations." (22:239)

To explain the striking relationship between interest and ability, Bingham has advanced the interesting theory "that early introversion of personality leads to the development, *through disproportionate exercise,* of one's native interests in mechanism or ideas, at the expense of interest and proficiency in social contacts." (1:359)

"Both interest and ability are functions of personality. Each affects and modifies the other. Vocational ability grows with exercise and training. Interest in any type of activity usually increases with growth of pertinent knowledge and skill. A bent toward introversion, then, is favorable to the enhancement of both interest and ability in dealing with machines, while the opposite sort of personality favours development in social interests and social effectiveness. Such considerations make plausible the facts—at first glance somewhat astonishing—regarding the correspondence found between introversion and vocational interest in mechanisms." (1:360)

Fryer studied 200 vocational counsel subjects and 513 employment applicants in relation to their work interests. The subjects indicated whether they were interested in working with people (*humanics*) or things (*mechanics*). In the vocational counsel group, 55 per cent indicated an interest in humanics; 36 per cent an interest in mechanics, and 9 per cent in both. In the employment applicant group 440 subjects answered the question. Thirty-three per cent were interested in humanics, 19 per cent in mechanics, and 48 per cent in both. Fryer concluded that, "Individuals are unable to make any generalized vocational interest distinctions of significant value for vocational prognosis." (12:309–10)

Additional work with various groups needs to be done before this generalization will be fully accepted. The vocational counsel subjects represented a highly selected group; 70 per cent were "superior" on the basis of the Army Alpha. While the commercial employment agency group may be representative of the general population in intelligence, it still is conceivable that its members do not represent a random sampling of those who are looking for positions. The vast majority of jobs are not filled through the employment agencies. Those applying to such agencies may be lacking in such traits as aggressiveness, self-confidence, ambition, etc. It is possible that the temperamental deficiencies of the group may influence any study of interests of this type. The fact that 48 per cent of the employment agency group indicated an interest in both humanics and mechanics, as compared with 9 per cent in the counsel group, may be indicative of a "decision factor" of considerable importance, so far as the chances of vocational success are concerned.

The findings of the four types of investigations cited seem to justify the following conclusions. The original work of Thorndike, and his review of the data of Bridges and Dollinger, indicate that there is a positive relationship between estimates of interest and estimates of ability. The work of Thorndike and Franklin seems to indicate that interests are permanent. The findings of Franklin and McHale lend evidence to support the theory that interests, when objectively measured, are an indication of ability. The investigations of Fryer, Proctor and Feingold indicate that interest in a *specific occupation* is not a satisfactory criterion of ability so far as intelligence is concerned.

Moore, Freyd and Ream seem to have demonstrated that interests are general rather than specific, and that, with sufficiently broad work classifications, interest may be considered an indication of ability. Cowdery and Strong have developed a technique for scoring interest analysis blanks so as to differentiate those with varying vocational interests.

C. TYPES OF INTEREST AND GENERAL INTELLIGENCE

The present report is based upon a study of 253 male students at the University of Wyoming. The median age of the subjects was 20.16 years. The youngest was born May 1, 1909; the oldest March 18, 1901. The men whose records comprise the data embodied in this report were classified as follows: 175 Freshmen, 46 Sophomores, 25 Juniors and 7 Seniors.

Each of the 253 men indicated his general line of interest on a mimeographed slip which contained the following, "My primary interest is in working with THINGS ( ) PEOPLE ( ) IDEAS ( )." A check mark was placed within the parenthesis following one of the three capitalized words. All the men had been given the Thorndike Intelligence Examination for High School Graduates upon entering the college. The Thorndike score was considered to be a measure of the ability "to manipulate ideas." A group of 125 of the men voluntarily completed the Stenquist Mechanical Aptitude Test No. 1. This record was considered a measure of the ability "to manipulate things." No measure of the ability "to manipulate people" was obtained.

The primary interests of the men were not limited to one field: 107 men, or 42.3 per cent of the total, expressed an interest in *things;* 94 men, or 37.2 per cent indicated an interest in *people,* and 52 men, or 20.5 per cent stated that they were interested in *ideas.* The proportions were consistent for two groups of 125 and 128 men. Table 1 shows the distribution of interests for the four groups.

The Thorndike Intelligence Examination scores ranged from 24 to 115. Table 2 shows the distribution of intelligence scores for the men in each of the interest classifications.

The mean score for those interested in *things* was 64.811 with a standard deviation of 16.85; the mean for the men interested in *people* was 61.063 with a standard deviation of 16.35. For those interested in *ideas* the mean was 68.726 with a standard deviation of 17.50. It is necessary to show whether the differences in the means for the three distributions are sufficiently

TABLE 1

Interest of college men

	THINGS	PEOPLE	IDEAS	TOTAL
Freshmen	78	59	38	175
Sophomores	16	23	7	46
Juniors	11	9	5	25
Seniors	2	3	2	7
Total	107	94	52	253
Per cent	42.3	37.2	20.5	100

TABLE 2

Thorndike scores and interest classifications

THORNDIKE	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	90–94	95–99	100–104	105–109	110–114	115–119	CASES
Things	1	2	1	1	4	14	7	19	15	9	8	7	12	3	2	2	1	1		1	107
People		2	1	3	12	8	12	8	14	4	12	5	4	5	1	2	1				94
Ideas				2	2	6	4	4	5	5	4	7	3	2	4	2	1	1			52

TABLE 3

Showing extent of difference between mean scores, Thorndike intelligence examination

	A. DIFFERENCE BETWEEN MEAN SCORES	B. STANDARD DEVIATION OF DIFFERENCE	RATIO A ÷ B
Ideas and people	7.663	2.935	2.61
Ideas and things	3.915	2.907	1.34
People and things	3.748	2.349	1.59

great to be considered significant. The standard deviation of the difference was computed for each combination.[1] Table 3 shows the actual differences between the means, the standard deviation of the difference for each pair, and the ratio of the actual difference to the standard deviation of the difference.

Conservative statistical practice does not consider the difference between means significant unless the actual difference is three times the standard deviation of the difference. In Table 3 it has been shown that the actual difference between the means of the intelligence scores for those indicating interest in "ideas" or "people" is 2.61 times the standard deviation of the difference. It has been suggested "that there is about one chance in one hundred and seventy that the smaller mean will equal or exceed the now larger mean if the conditions specified above are true. One may conclude from this that the difference found may be due entirely to chance factors." No significant difference appears to exist between those interested in "ideas and things," or between those interested in "people and things."

D. TYPES OF INTEREST AND MECHANICAL APTITUDE

If those who indicate an interest in ideas tend to make higher scores in such a test as the Thorndike Intelligence Examination, it would be worth-while to determine whether those who indicate an interest in things tend to make higher scores in the Stenquist Mechanical Aptitude Test. No attempt was made to select the men. One hundred and twenty-five reported voluntarily. The scores ranged from 37 to 94. Table 4 shows the distribution of mechanical aptitude scores for each of the interest classifications.

The mean score for those interested in *things* was 80.227 with a standard deviation of 8.020; the mean for the men interested in *people* was 71.802 with a standard deviation of 11.40. For those interested in *ideas* the mean was 73.240 with a standard deviation of 15.135. Table 5 shows the actual differences between the means, the standard deviation of the difference for each pair, and the ratio of the actual difference to the standard deviation of the difference.

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[1] Kelley, Truman L. Statistical Method, p. 85 and p. 182. The Macmillan Co., New York, 1923.

Yule, G. Udny. An Introduction to the Theory of Statistics, p. 344f. Charles Griffin & Co., Ltd., London, 1919, fifth ed.

I wish to acknowledge the courtesy of Professor Kelley in replying to my questions concerning the formula used in this report, and also the kindness of Mr. Harold A. Edgerton in checking my computations.

Table 5 shows that a significant difference exists between the mean scores in the mechanical aptitude test for those indicating interest in "things" and "people." In this case, the actual difference between the mean scores is 4.11 times the standard deviation of the difference. No significant difference appears to exist between those interested in "things and ideas," or between those interested in "people and ideas."

TABLE 4

Stenquist scores and interest classification

STENQUIST	36–39	40–43	44–47	48–51	52–55	56–59	60–63	64–67	68–71	72–75	76–79	80–83	84–87	88–91	92–95	CASES
Things							2	4	6	6	4	10	9	13	1	55
People		1	1	2	1		1	5	9	6	8	3	5	1		43
Ideas	2		1				4	1	1	4	4	6	1	1	2	27

TABLE 5

Showing extent of difference between mean scores, Stenquist Mechanical Aptitude Test

	A. DIFFERENCE BETWEEN MEAN SCORES	B. STANDARD DEVIATION OF DIFFERENCE	RATIO A ÷ B
Things and people	8.425	2.046	4.11
Things and ideas	6.987	3.105	2.25
People and ideas	1.438	3.388	

E. CONCLUSIONS AND DISCUSSION

1. In a group of 253 male college students whose median age was 20.16 years, 42.3 per cent indicated an interest in things;

37.2 per cent an interest in people, and 20.5 per cent an interest in ideas.

2. The mean scores on the Thorndike Intelligence Examination for the three interest classifications were as follows: ideas, 68.726; things, 64.811; people, 61.063.

3. The actual difference between the mean intelligence scores of those indicating an interest in ideas and those indicating an interest in people was 7.663 points. The actual difference is 2.61 times the standard deviation of the difference. It is estimated that there is one chance in one hundred seventy that the smaller mean will equal or exceed the now larger mean. While this does not prove conclusively that a significant difference exists between the levels of general intelligence for the two groups considered, it may be indicative of a "drift" or "slant," so far as these small groups are concerned.

4. No significant difference appears to exist in the levels of general intelligence for those indicating interest in ideas and things, or between those indicating interest in people and things.

5. The mean scores on the Stenquist Mechanical Aptitude Test for the three interest classifications were as follows: things, 80.227; ideas, 73.240; people, 71.802.

6. The actual difference between the mean mechanical aptitude test scores of those indicating an interest in things and those indicating an interest in people was 8.425 points. The actual difference is 4.11 times the standard deviation of the difference. We conclude that there is little likelihood that the difference found is due to chance. It appears that, for the small number of cases studied, a significant difference exists in the levels of mechanical aptitude for those indicating interest in things and interest in people, respectively.

7. No significant difference appears to exist in the levels of mechanical aptitude for those indicating interest in things and ideas, or between those indicating interest in people and ideas.

8. In both the Thorndike Intelligence Examination, and the Stenquist Mechanical Aptitude Test, those indicating interest in people tended to make lower scores than those indicating interest in ideas or things.

9. The correlation between Thorndike and Stenquist scores for 125 cases was + 0.25.

From the point of view of those engaged in curriculum construction, and in employment management, the indication of interest probably should be given consideration. If the distinctions indicated in this paper hold true for a larger number of cases, and for widely selected groups, it becomes apparent that, in the long run, levels of ability will be approximated, depending upon the types of interests represented. Carrying the hypothesis one step further, it seems that, for the majority of cases, the schools that are organized to train people to work in such fields as authorship, scientific research, etc., should try to attract those interested in ideas. Schools designed to train students to work with things should endeavor to attract those who are interested in things. If later, data are brought forward that indicate that interest in people is an indication of ability "to manipulate people," then the schools that are organized to train people to work with people should endeavor to attract students who are interested in people.

In actual practice, it is obvious that all organizations need people of all three types. This point is admirably illustrated in the case of the typical public utility company. Most of these companies have a commercial department that deals directly with the public; operating and maintenance departments that work primarily with things, and executive and research departments where the major portion of the time is spent in working with ideas. These ideas, it is true, are expressed through the manipulation of people and things. Also, it must be borne in mind that the executive and research departments have no monopoly on ideas. They occur throughout the organization. In such a company, there is a rough division of labor in terms of working with things, people, and ideas. Assuming that all three types of interest are correlated with ability, it will be profitable in the long run for the commercial department to select the majority of its workers from the ranks of those interested in people, for the operating and maintenance departments to specialize in those interested in things, and for the executive and research departments to look for those interested in ideas. Until methods of measuring interest objectively are perfected, the vocational counsellor and the employment manager will have to rely upon personal estimates of interests if they consider this factor in placement.

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SOME FACTORS INVOLVED IN JUDGING PERSONAL CHARACTERISTICS

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The earlier investigators in the field of personality study were interested primarily in the ability of various people to judge either themselves or others and the reliability of the judgments. Examples of this type of work are found in the reports of Cattell and Hollingworth. A different type of work has been undertaken by Woodworth and others in their tests of emotional instability. Under this type many of the case history forms, which have been developed for psychiatric use, might be included. These, however, are not tests and hence are of little practical value for experimental work. In regard to work on psychopathic personalities, it will suffice to mention two rather distinct lines of work that have been undertaken, namely, the association tests devised by Kent and Rosanoff and the physiological work developed by Travis. A still different course has been pursued by Pressey and Downey in their respective tests—The Pressey X-O Test and the Downey Will-Temperament Test. Pressey has attempted to discover certain trends of personality by having the subject select from a list of words, the word or words which the subject feels may be in correspondence with the particular stimulus word. Downey has endeavored to ascertain what qualities an individual possesses, by constructing a particular situation for each of the qualities for which the test is supposed to be a measure. It was in this test that the time factor was first given significant weight.

The neglect in previous studies of the time factor as index of difficulty and also the neglect of sex differences has seemed to make a much more careful study of these factors desirable.

For the present investigation, a list of characteristics was selected, of which certain ones were chosen as being of importance for detecting possible abnormal tendencies; others were included because they were of importance for determining the general makeup of the individual. The following sample sheet will show the actual characteristics used.

Name.............................. Date........................

Indicate your judgment of the personal characteristics of,

....

by checking in the appropriate column in front of each characteristic.

ABOVE	AVERAGE	BELOW		ABOVE	AVERAGE	BELOW	
			Honesty				Fondness for children
			Height				Mathematical ability
			Obstinacy				Devotion to duty
			Kindness				Ingenuity
			Reliability				Artistic appreciation
			Good looks				Fondness for animals
			Orderliness				Tendency to worry
			Awkwardness				Memory capacity
			Recklessness				Conversational ability
			Self-confidence				Leadership
			Intelligence				Love of sports
			Truthfulness				Interest in politics
			Vanity				Quarrelsomeness
			Industry				Egotism
			Loyalty				Maliciousness
			Wit				Neatness of dress
			Caution				Liking for perfume
			Modesty				Skill in card playing
			Fluency				Bodily vigor
			Extravagance				Interest in the other sex
			Tactfulness				Carefulness in money matters
			Ambition				Attractiveness to the other sex
			Quickness				Fondness for reading
			Cheerfulness				Religiousness
			Laziness				Reasoning ability

TABLE I

Showing the average time required by the males to judge each characteristic

	AVERAGE TIME FOR FRIEND	ST. D.	AVERAGE TIME FOR SELF	ST. D.
Ingenuity	1.0	0.5	1.8	0.7
Reasoning ability	1.6	0.0	1.8	0.5
Egotism	1.6	0 5	2.08	0.7
Mathematical ability	1.7	0.6	2.06	0.8
Love of sports	1.7	0.4	1.8	0.0
Artistic appreciation	1.7	0.5	2.04	0.9
Devotion to duty	1.8	0.7	2.0	0.6
Interest in politics	1.8	0.5	2.06	0.8
Conversational ability	1.8	0.5	2.2	0.7
Leadership	1.8	0.7	1.8	0.5
Religiousness	1.0	0 6	1.7	0.5
Maliciousness	1.9	0.8	2.2	0.0
Fondness for animals	1.0	0 7	2.04	0.7
Memory capacity	2.0	0.7	2.3	0.0
Neatness of dress	2.0	0.7	2.0	0.0
Skill in card playing	2.0	0.7	2.04	0.7
Quarrelsomeness	2.0	0.7	2.2	0.7
Interest in the other sex	2.02	0 5	2.2	0.6
Carefulness in money matters	2.04	0.6	2.8	1.02
Cheerfulness	2.04	0.0	2.0	0.0
Bodily vigor	2.1	0.9	2.0	0.6
Liking for perfume	2.1	0.4	2.00	0.4
Tendency to worry	2.1	0.0	2.3	0.8
Fondness for reading	2.1	0.7	2.2	0.8
Attractiveness to other sex	2.2	0.7	2.4	0.7
Laziness	2.2	1.4	1.8	0.8
Quickness	2.2	0.8	1.8	0.6
Ambition	2.2	0.7	2.0	0.9
Wit	2.2	0.0	1.8	0.5
Loyalty	2.2	1.04	1.9	1.04
Intelligence	2.2	1.1	2.06	0.0
Kindness	2.2	0.8	1.0	0.7
Reliability	2.3	1.4	2.02	1.0
Good looks	2.3	1.0	1.0	0.6
Orderliness	2.4	0.5	2.0	0.8
Extravagance	2.4	1.1	2.2	0.7
Industry	2.4	1.1	2.0	0.5

TABLE 1—*Concluded*

	AVERAGE, TIME FOR FRIEND	ST. D.	AVERAGE TIME FOR SELF	ST. D.
Vanity	2.4	0.9	2.04	0.7
Truthfulness	2.4	1.4	2.2	0.8
Self-confidence	2.5	1.02	2.2	0.9
Tactfulness	2.5	0.9	2.4	1.2
Recklessness	2.5	0.8	2.5	1.4
Height	2.5	1.1	1.8	0.4
Awkwardness	2.6	1.3	2.2	0.8
Fluency	2.6	1.2	2.1	0.9
Obstinacy	2.7	1.1	2.2	0.8
Caution	2.7	2.0	2.4	1.1
Modesty	2.9	1.7	2.4	0.7

Fifty individuals of each sex[1] were tested. They were asked to pick out some friend of their own sex whom they knew well and of whose personal characteristics they could judge. They were then given a pencil,[2] arranged with electrical contacts, and were asked to check the person whom they chose on the list of traits presented. The time taken to check each trait was measured in fifths of a second. When the reactors had completed checking one-half the number of traits, they were stopped. They were then told to judge themselves on the same traits. Upon finishing this they were given the second half of the list and were then asked to judge themselves on those traits. Following that, they judged their friend in regard to the second half of the list.

The same characteristics were presented to another group of 50 men and 80 women. Each individual of this group was asked to judge himself on the traits. The individuals of this same group were then told to rate each characteristic as desirable, unde-

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[1] The subjects used in this experiment were undergraduate students in Psychology in Goucher College and this University.

[2] Dorcus, Roy M.: A contact pencil for psychological use. Jour. Comp. Psychol., vol. 6, no. 5, October, 1926.

TABLE 3

Showing the average time required by the females to judge each characteristic

	AVERAGE TIME FOR FRIEND	ST. D	AVERAGE TIME FOR SELF	ST. D.
Reasoning ability	1.6	0.5	1.7	0.5
Religiousness	1.7	0.5	2.01	0.7
Ingenuity	1.7	0.6	2.00	0.6
Mathematical ability	1.7	0.6	2.0	0.8
Love of sports	1.8	0.6	1.8	0.6
Leadership	1.8	0.8	1.9	0.5
Egotism	1.8	0.7	2.2	0.8
Cheerfulness	1.8	0.7	2.08	0.9
Interest in politics	1.9	0.5	2.1	0.6
Maliciousness	1.9	0.8	2.4	1.1
Conversational ability	1.9	0.6	2.1	0.6
Laziness	1.9	0.8	1.9	1.02
Fondness for reading	2.02	0.7	2.3	0.8
Bodily vigor	2.04	0.7	2.1	0.6
Liking for perfume	2.01	0.9	2.2	0.6
Artistic appreciation	2.01	0.7	2.2	0.8
Devotion to duty	2.04	0.8	2.2	0.9
Wit	2.01	0.6	1.8	0.6
Neatness of dress	2.06	0.7	2.1	0.9
Interest in the other sex	2.08	0.8	2.2	0.6
Skill in card playing	2.1	0.7	2.1	0.5
Fondness for animals	2.1	0.7	1.9	0.6
Quarrelsomeness	2.1	0.7	2.3	0.7
Attractiveness to other sex	2.2	0.7	2.7	1.2
Memory capacity	2.2	0.8	2.2	0.7
Intelligence	2.2	0.6	1.9	0.5
Quickness	2.2	0.9	2.06	0.8
Tendency to worry	2.2	0.7	2.3	0.7
Loyalty	2.3	1.08	2.3	1.3
Truthfulness	2.3	1.02	2.2	0.9
Reliability	2.3	0.8	2.3	0.9
Good looks	2.4	1.1	2.08	0.7
Modesty	2.5	0.9	2.08	0.8
Kindness	2.5	0.8	2.08	0.7
Tactfulness	2.5	0.9	2.2	0.9
Ambition	2.5	1.2	2.1	0.8
Carefulness in money matters	2.5	1.1	2.7	0.9

TABLE 2—*Concluded*

	AVERAGE TIME FOR FRIEND	ST. D.	AVERAGE TIME FOR SELF	ST. D.
Extravagance	2.5	1.1	2.3	1.06
Vanity	2.6	1.2	2.4	0.8
Self-confidence	2.6	0.6	2.1	0.5
Industry	2.6	1.1	2.3	0.9
Height	2.6	0.6	1.9	0.7
Fluency	2.7	1.1	2.2	0.8
Orderliness	2.7	1.06	2.3	0.8
Awkwardness	2.8	1.2	2.3	1.2
Caution	2.8	1.2	2.7	1.5
Recklessness	2.8	1.4	2.5	1.2
Obstinacy	3.0	0.9	2.3	1.2

sirable, or neutral for their own sex and also for the opposite sex.

The tabulation of the data obtained from the foregoing procedure shows some rather interesting results. If we consider the average time (tables 1 and 2) required by the group to judge each characteristic, we find that the times are unreliable. That is, the Probable Error of the Difference of the Averages is nearly as great as the Difference of the Averages. This may have two possible explanations. The measurements obtained may not be fine enough or different individuals may have difficulty with different traits. If the latter is true, a composite of the judgments for a single trait would tend to cause these differences to flatten out. It is worth while to note certain other points which these tables bring out. If tables 1 and 2 are examined, it will be found that those traits in regard to which the men have been able to make quick decisions in characterizing their friends and themselves are the same traits in regard to which women have also been able to make quick decisions; and the same correspondence appears in the slow decisions of the two sexes. The coefficient of correlation between the time taken by the males to judge *their friends* and the time taken by the females to judge their friends is 0.87 ± 0.02. The coefficient for the same groups in judging themselves is 0.80 ± 0.03. There is little relation between the time taken to judge one's friend and the time taken to judge one's self on any given trait for either the male or female group. The coefficients are 0.40 ± 0.08 and 0.32 ± 0.10 for the males and females respectively.

The men require from 0.3 to 0.7 second more to judge their friends than themselves on seventeen of the traits and from 0.3 to 0.5 second more to judge themselves than their friends on seven of the traits. The women require from 0.3 to 0.7 second longer in judging their friends on thirteen traits and from 0.3 to 0.5 second longer in judging themselves on seven traits. There is a rather general agreement between the two sexes as to the traits which require longer to judge for their friends than for themselves and vice versa.

The range of time is rather uniform for the male and female groups with reference to both their friends and themselves. The range for the male group is from 1.6 to 2.9 seconds for judging their friends and from 1.7 to 2.9 seconds for judging themselves. The range for the female group for judging their friends is from 1.6 to 3 seconds, and for judging themselves from 1.7 to 2.7 seconds.

The characteristic for the female group, when judging their friends, which has the greatest standard deviation is *recklessness;* the one having the greatest standard deviation, when judging themselves is *caution.* Reasoning ability, religiousness, and interest in politics, each has a standard deviation of 0.5 for the female group when judging their friends. Reasoning ability, leadership, skill in card playing, intelligence, and self-confidence, each has a standard deviation of 0.5 for the same group in judging themselves. The smallest deviation which occurred for any of the female judgments was 0.5. The largest deviation for the male group is obtained for caution and recklessness. Caution gave the greatest deviation for their judgment of their friends and recklessness gave the greatest deviation for their judgment of themselves. The relation between recklessness and caution is reversed by the female group. Caution and recklessness have high deviations for both groups and for both sexes. Love of sports and liking for perfume show the smallest deviation (0.4) by the males in their judgments of their friends; liking for perfume and height show the smallest in their judgment of themselves. The tendencies which have been pointed out suggest that more than just chance determines how much time is required to judge each characteristic.

TABLE 3

Showing the average time required to judge the 48 characteristics in seconds

	MEN		WOMEN		DIF. AVG.	P.E.D.A.
Group 1 requiring longer time to judge themselves						
Average time for themselves	100.7	P.E. 10.5	116.3	P.E. 26.1	15.5	6.5
Average time for friend.....	01.6	P.E. 10.2	107.7	P.E. 23.7	16.1	6.2
Dif. Avg......	9.1	P.E.D.A. 2.9	8.5	P.E.D.A. 8.5		
Group 2 requiring longer time to judge friends						
Average time for themselves	100.5	P.E. 10.2	08.7	P.E. 11.1	1.8	3.9
Average time for friend.....	110.0	P.E. 10.7	100.8	P.E. 13.6	0.2	4.2
Dif. Avg......	9.4	P.E.D.A. 4.8	11.1	P.E.D.A. 3.1		

Table 3 shows the average time in seconds required for judging all the traits. Group 1 in this table contains the individuals who required longer time to judge themselves and group 2 contains those individuals who required longer time to judge their friends. One point of particular interest in this table is, that in the second group the men and women require about the same time for judging their friends and for judging themselves, while in the first group the women need a longer

TABLE 4

Showing the characteristics as classified by the females for the male group and as classified by the males for themselves

	FEMALES					MALES				
	1	2	3	4	5	1	2	3	4	5
Height	✓								36 60	
Obstinacy		✓					✓			
Kindness	✓					✓				
Reliability	✓					✓				
Good looks				42.5 57.5					40 54	
Orderliness	✓					✓				
Awkwardness		✓					✓			
Recklessness		✓					✓			
Self-confidence	✓					✓				
Intelligence	✓					✓				
Truthfulness	✓					✓				
Vanity		✓					✓			
Industry	✓					✓				
Loyalty	✓					✓				
Wit	✓					✓				
Caution	✓					✓				
Modesty				60 40		✓				
Fluency	✓					✓				
Extravagance		✓					✓			
Tactfulness	✓					✓				
Ambition	✓					✓				
Quickness	✓					✓				
Cheerfulness	✓					✓				
Laziness		✓					✓			
Mathematical ability				56.2 43.8					48 44	
Devotion to duty	✓					✓				
Ingenuity	✓					✓				
Artistic appreciation	✓					✓				
Fondness for animals	✓								48 52	
Tendency to worry		✓					✓			
Memory capacity	✓					✓				

TABLE 4—*Concluded*

	FEMALES					MALES				
	1	2	3	4	5	1	2	3	4	5
Conversational ability	✓					✓				
Leadership	✓					✓				
Love of sports	✓								60 40	
Interest in politics	✓								42 50	
Quarrelsomeness		✓					✓			
Egotism		✓					✓			
Maliciousness		✓					✓			
Neatness of dress	✓					✓				
Liking for perfume		✓								60 40
Skill in card playing			✓					✓		
Bodily vigor	✓					✓				
Interest in the other sex			✓						44 54	
Carefulness in money matters	✓					✓				
Attractiveness to other sex				60 38.8					44 54	
Fondness for reading	✓					✓				
Religiousness	✓								56 32	
Reasoning ability	✓					✓				

1, desirable; 2, undesirable; 3, neutral; 4, desirable-neutral; 5, undesirable-neutral.

time than the men for judging both themselves and their friends. By comparing the time required to judge one's self with the time required to judge one's friend certain tendencies are quite evident. These total measurements should throw some light on the makeup of the individual making the judgments. If in conjunction with these measurements, the traits are noted which require an excessively long time to judge—excessively long with respect to the individual's average time for judging any trait—one might ascertain whether the subject has egocentric or the reverse tendencies.

TABLE 5

Showing the characteristics as classified by the males for the female group and as classified by the females for themselves

	FEMALES					MALES				
	1	2	3	4	5	1	2	3	4	5
Height			✓							44 52
Obstinacy					62 38		✓			
Kindness	✓					✓				
Reliability	✓					✓				
Good looks				53 47		✓				
Orderliness	✓					✓				
Awkwardness		✓					✓			
Recklessness		✓								58 32
Self-confidence	✓					✓				
Intelligence	✓					✓				
Truthfulness	✓					✓				
Vanity					61 35		✓			
Industry	✓					✓				
Loyalty	✓					✓				
Wit	✓					✓				
Caution	✓					✓				
Modesty	✓					✓				
Fluency	✓								54 40	
Extravagance		✓					✓			
Tactfulness	✓					✓				
Ambition	✓					✓				
Quickness	✓					✓				
Cheerfulness	✓					✓				
Laziness		✓					✓			
Mathematical ability				31 68				✓		
Devotion to duty	✓					✓				
Ingenuity	✓					✓				
Artistic appreciation	✓					✓				
Fondness for animals				63 37					42 56	

TABLE 5—*Continued*

	FEMALES					MALES				
	1	2	3	4	5	1	2	3	4	5
Tendency to worry		✓					✓			
Memory capacity	✓					✓				
Conversational ability	✓					✓				
Leadership	✓								44 50	
Love of sports				58 42					60 40	
Interest in politics				48 52						24 62
Quarrelsomeness		✓					✓			
Egotism		✓					✓			
Maliciousness		✓					✓			
Neatness of dress	✓					✓				
Liking for perfume			✓						60 20	
Skill in card playing			✓					✓		
Bodily vigor	✓					✓				
Interest in the other sex			✓			✓				
Carefulness in money matters	✓					✓				
Attractiveness to other sex				55 45		✓				
Fondness for reading	✓					✓				
Religiousness	✓								52 40	
Reasoning ability	✓					✓				

1, desirable; 2, undesirable; 3, neutral; 4, desirable-neutral; 5, undesirable-neutral.

The measurements also show that 32 of the 50 males tested required longer to judge their friends than themselves; 17 showed the reverse relation; and one took the same time. This ratio of approximately 2:1 holds true also for the females. The actual figures are the same as quoted for the males.

Another factor of importance in this work is the influence of the desirability of the trait judged upon the time taken to judge it. Before times can be compared for judging the desirable, undesirable, and neutral traits, it is necessary to know just which ones belong to which group. It is also of importance to know whether the males and females place the same traits in the same groups. Tables 4 and 5 show the characteristics in their respective classifications. Under column head "Female" in table 4 are the judgments of the females concerning the desirability of the traits for the opposite sex, and in table 5 their judgments for their own sex. Under column headed "Males" in table 4 are recorded the judgments of the males for their own sex, and in table 5 their judgments for the opposite sex. Wherever a trait is listed by a check mark in the desirable, undesirable, or neutral groups, it indicates that 70 per cent or over of the individuals tested, placed the trait in that group. Two other classifications also appear, namely, "Desirable-Neutral" and "Undesirable-Neutral." These classifications mean that the preponderance of the choices fell into either one or the other of the pair in each classification, but that neither received a sufficiently large percentage to make the trait decisively either one or the other. For the traits listed under those groups, the actual percentages are quoted in the same order as the grouping. For example, in table 4 *good looks* under the grouping "Desirable-Neutral" received 42.5 to 57.5 per cent which indicates that 42.5 per cent of the individuals thought it desirable and 57.5 per cent thought it a neutral trait. These tables show that both the men and women, with but few exceptions, classified the traits in the same way. They agree rather generally that the traits which are desirable for their own sex are also desirable for the opposite sex. Also, it may be said that those traits which men consider desirable for men, the women also consider desirable for men. This same condition holds true for the neutral and undesirable traits. The exceptions can be ascertained easily by glancing at the tables. No further elaboration is necessary at this point. Reference will hereafter be made to desirable, undesirable, and neutral traits on a basis of the groupings just described.

Table 6 shows the distribution of judgments in percentages for the different groups of traits. If, for example, we take the group of traits which the males think desirable, we find that 28.6 per cent of the reactors judged themselves above the average, 60.2 per cent average, and 11.2 per cent below the average. Of the 28.6 per cent who judged themselves above the average, 26.7 per cent thought the traits desirable, 0.2 per cent thought the traits undesirable, and 1.7 per cent thought them neutral. The percentages show then that most of the individuals believe they are average or above in the traits which they consider desirable; in the traits which they consider undesirable they rate themselves average or below, and for the traits which they consider neutral they also rate themselves

TABLE 6

Showing the relationship between the classification of the traits and the amount which the individuals believe they possess of the traits

	ABOVE			AVERAGE			BELOW		
	Desirable	Undesirable	Neutral	Desirable	Undesirable	Neutral	Desirable	Undesirable	Neutral
Males									
Desirable	26.7	0.2	1.7	53.8	0.3	6.1	8.8	0.6	1.8
Undesirable	0.6	11.0	2.0	1.2	37.8	6.8	0	39.0	1.6
Neutral	2.0	2.0	8.0	8.0	0	32.0	2.0	16.0	30.0
Desirable-Neutral	13.0	0	5.0	23.3	1.1	27.9	5.9	7.5	16.3
Total traits	18.2	2.4	2.6	35.3	8.4	11.3	6.2	10.2	5.4
Females									
Desirable	10.4	0.1	1.2	60.9	0.1	5.7	12.2	0.1	3.3
Undesirable	0.4	12.1	2.0	0.1	49.7	4.4	0.4	28.8	2.1
Neutral	2.2	1.0	8.5	12.0	0	39.0	6.0	4.8	26.5
Desirable-Neutral	15.0	0	6.2	28.8	0.2	20.0	11.3	0.2	18.3
Undesirable-Neutral	0.6	12.4	8.1	1.3	36.9	25.0	0	11.9	38.0
Total traits	11.4	2.7	2.9	39.8	9.0	11.2	9.1	5.8	7.2

average or below. This relation holds true for both sexes, but there is one sex difference that ought to be noted: more of the females think they are average in the desirable characteristics than do the males. This increase in the "average" column is made at the expense of the column marked "above the average."

TABLE 7

Average time, in seconds, required to make respective judgments

	ABOVE	ST. D.	AVERAGE	ST. D.	BELOW	ST. D.
			Females			
Friend:						
Desirable	2.08	0.3	2.3	0.3	2.2	0.4
Undesirable	2.3	0.4	2.3	0.3	2.3	0.5
Neutral	2.04	0.5	2.1	0.2	2.1	0.3
Desirable-Neutral	1.9	0.3	2.08	0.18	2.2	0.3
Self:						
Desirable	2.2	0.4	2.1	0.2	2.1	0.3
Undesirable	2.3	0.3	2.3	0.2	2.2	0.3
Neutral	2.02	0.2	2.1	0.2	2.0	0.1
Desirable-Neutral	1.9	0.2	2.2	0.2	2.0	0.3
			Males			
Friend:						
Desirable	2.06	0.2	2.1	0.3	2.1	0.4
Undesirable	2.2	0.3	2.1	0.3	2.2	0.3
Neutral	....	...	....	....	...	...
Desirable-Neutral	1.8	0.2	2.0	0.18	1.9	0.2
Self:						
Desirable	2.1	0.3	1.9	0.18	2.2	0.4
Undesirable	2.3	0.2	2.0	0.10	2.1	0.3
Neutral	....	...	....	....	...	...
Desirable-Neutral	2.1	0.3	2.1	0.16	2.0	0.2

Table 7 shows the average time required to judge any trait falling into any one of the given groups. Thus 2.08 represents the average time in seconds taken to judge any desirable trait when the individual marks his friend above the average. These times are computed by finding the average time required by the individuals to judge each trait. These average times are then grouped according as to whether the trait falls into the desirable, undesirable, or neutral category and the average of these measurements is then obtained. The times thus secured are for the most part statistically unreliable. The standard deviation is in most cases large for the differences in the averages. There are certain tendencies, however, which are apparent, namely, that the females take on the average longer than do the males for making judgments above the average, average, and below the average both in the case of themselves and of their friend. By both the male and female groups, a somewhat longer time is consumed in estimating undesirable traits than in estimating desirable traits or neutral traits.

In summarizing, one may say:

1. That it does require longer to judge some characteristics than others. However, on account of the individual differences in the time required by different persons to judge the various traits, the average time taken by a group of people to judge one trait is not significantly different from the time taken to judge another trait.

2. That about twice as many people need longer time to judge their friends than to judge themselves.

3. That there is rather general agreement as to the traits which both sexes consider desirable, undesirable, and neutral for themselves and for each other.

4. That there is a tendency to require a longer time to judge the undesirable traits.

5. That the amount of time taken to make a judgment above the average, average, or below the average is about the same.

6. That the women require, on the average, longer time for judging the traits than do the men.

7. That the relation between the desirability of a trait and the individual's rating of himself in regard to that trait, is about as would be expected. Individuals tend to class themselves as above the average or average in the traits which they consider desirable and as below the average or average in the traits which they consider undesirable or neutral.

8. That further study of individual differences in the time required to judge different traits, in themselves and in others, is desirable, and may lead to useful methods of determining the personal characteristics of those by whom the judgments are made.

A CASE OF SPECIAL ABILITY WITH BELOW AVERAGE INTELLIGENCE

JUNE E. DOWNEY

University of Wyoming

Some years ago I had a chance to give an intelligence test to a man demonstrating memory stunts on various platforms under the title "World's Champion on Memory." The results of the test are exceedingly interesting since there was no question of the man's remarkable gift in repeating from memory numbers seen on cash registers, automobiles, freight cars that he had seen casually with no time for intensive study. I myself heard him repeat from memory numbers on freight trains in the order in which they had passed him while serving as brakeman, the record covering several pages in the notebook of the conductor under whom he worked.

Tested in the laboratory under the usual conditions that would be used in determining the visual memory span for digits, he repeated 27 digits with three errors in reproduction. He knew and stated the position of the numerals but did not give them in serial order, breaking them up into certain groups. He found it difficult to conform to the laboratory procedure in the presentation of the digits and in the timing of the memorizing. Accordingly a second set of 27 digits was presented to him. In this case he took the cards upon which the digits were printed in his own hand and studied them for approximately 70 seconds. They were then reproduced accurately, about 28 seconds being taken for the reproduction. He was then asked to give the two sets that he had memorized, 54 digits in all, and succeeded with no new stimulation in reproducing 35 in their proper order.

This record is certainly an extraordinary one, and particularly when considered in the light of the subject's score on an

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This record is certainly an extraordinary one, and particularly when considered in the light of the subject's score on an intelligence test. The intelligence test given him was the Terman Adult Test. I commenced with year XIV. I realized later that I should have commenced with an earlier year test. His I.Q. was 92.6 and this would probably have been lowered had the XII year test been given.

The test revealed some very interesting inequalities in capacity, for example, high-power visual with little evidence of average auditory memory, and little capacity to handle problems that involved reasoning. For example, the clock test in year XIV was handled very rapidly, but the code test in year XVI was not handled successfully. It was evident that the subject visualized in spots but got no idea of the relationships involved. The auditory memory test of 6 digits backwards caused him some trouble, while he failed on all three of the 8 digit tests as given, orally, for year XVIII.

His repetition of the passages used in year XVIII for logical memory was most interesting. The first one is "Tests such as we are now making are of value both for the advancement of science and for the information of the person who is tested. It is important for science to learn how people differ and on what factors these differences depend. If we can separate the influence of heredity from the influence of environment we may be able to apply our knowledge so as to guide human development. We may thus in some cases correct defects and develop abilities which we might otherwise neglect." He reported that he had seen this piece of "scripture" on a pennant in the Panama Exposition, and this is his reproduction of the passage: "Science to figure out the absolute of each person of mind and lead to benefit for education, leading towards a better success for education or uplift of humanity."

I may say that as regards auditory memory he was sure that he could duplicate his visual achievements in this second field if he cared to do so. He had not, however, been interested enough to try it.

The subject showed very little penetration in handling the fable tests. The moral, for instance, for the fable of the milkmaid and her pans was stated as follows: "To deal without doubts and to protect without chance." In this instance the subject is seeking to explain his own philosophy of memory, namely, that if individuals would trust their memories all might achieve remarkable results. He is continually urging people to allow no doubts to enter their minds. He is not the only adult that in my experience with the fables has interpreted them in accordance with his own favorite philosophy.

The vocabulary test showed in a very clear-cut fashion the subject's limitations in the way of precise ideas, his inclination to resort to wild guessing and his tendency to grandiloquent verbiage. To give a few examples. "Perfunctory" he defined as "intent of positive;" "cameo" as "retaining view," "promontory" as "intent to be prompt," "gelatinous" as "intent of language."

The test was most enlightening as the subject's special ability stood out in a startling fashion against a background of the most mediocre comprehension. The secret of his achievement is probably interest in numbers, developed by his work, and a consequent playing with them which led to certain definite habits of grouping them and handling the groups as units.

NOTES AND NEWS

Prof. Jesse H. White, head of the Department of Psychology, University of Pittsburg, reports the following additions: Harry M. Johnson, Ph.D., Lecturer; Omar C. Held, John T. Seaton, Alfred J. Dietze, Instructors; Grace Jones, Inez Love, Graduate Assistants.

Teachers College, Columbia, has received a gift of $100,000 from Mrs. Richard H. Hoe for the purpose of endowing a professorship in education. Prof. George A. Coe is to be retired from active service February 1, 1927.

The Department of Psychology, University of Kentucky, is now able to devote more attention to personnel problems and clinical, abnormal and social psychology. Gardner C. Bassett and James L. Graham have been appointed Associate and Assistant Professor respectively. Provision has been made for a graduate laboratory assistant and two graduate scholars.

From November 29 to December 11 at Clark University the Case For and Against Psychical Research was discussed in a series of lectures by Professors Joseph Jastrow, F. C. S. Schiller, Hans Driesch, Drs. L. R. Crandon, Walter F. Prince and Gardner Murphy; Mr. Frederick B. Bond and Mrs. Margaret Deland. Manuscripts were received from Sir Arthur Conan Doyle, Mrs. Mary Austin, and Professors William McDougall and John E. Coover.

New York University reports the appointment of Dr. L. H. Lanier as Instructor in Psychology. Professors Robert McDougall and J. E. Lough are on leave of absence, the latter with the "Floating University" which is now in Pacific waters.

The University of Kansas, Department of Psychology, announces the appointment of Dr. Harry Helson as Assistant Professor to succeed Dr. William T. Heron who has accepted appointment to a similar position in the University of Minnesota.

Wittenberg University, Springfield, Ohio, reports Dr. Homer G. Bishop as Associate Professor and Dr. Margaret Kincade Bishop as Assistant Professor of Psychology.

Dr. Grace Arthur of the Child Guidance Clinic, Amherst Wilder Charity, St. Paul, Minn., has received a grant from the Commonwealth Fund for use in restandardizing the new Point Performance Scale described in this Journal, December 1925.

The University of California reports the appointment of Dr. E. G. Wever as Instructor in Psychology. Dr. Olga Bridgman, Associate Professor, offered courses at Columbia University during the past summer and attended the International Congress of Psychology at Grönigen and will visit European clinics while on a sabbatical leave. Dr. George M. Stratton will return as head of the department after serving a year in Washington as chairman of the Division of Anthropology and Psychology of the National Research Council.

Rutgers College, Department of Philosophy and Psychology, has inaugurated this year a Psychological Clinic for school children, juvenile court cases and university students. Sidney A. Cook, formerly instructor, now Assistant Professor, is in charge.

The University of Cincinnati has in prospect a newly organized department of Educational Psychology directed by Prof. Harlin C. Hines with seven additional personnel members.

The University of Wisconsin will have this year as a member of its staff Prof. Kurt Koffka of Germany. Prof. Jastrow has a year's leave of absence. Prof. Clark L. Hull has established a correlation service made possible by his invention of a new automatic correlation machine. Upon application an estimate of the cost of solving problems in correlation will be given.

The University of Wyoming has granted leave of absence from September to April to Prof. R. S. Uhrbrock. Miss Nancy Bayley, University of Iowa, is a new member of the psychology staff.

Ohio Wesleyan University announces the appointment of Dr. Franklin Fearing, Associate Professor, and Willard Valentine, Instructor in Psychology. The department has new quarters in the remodeled gymnasium consisting in all of nineteen rooms.

Vanderbilt University announces the appointment of Dr. John M. Fletcher, Tulane University, to a Professorship of Psychology.

The University of Michigan reports that Prof. William Clark Trow has returned from his year of service as visiting Associate Professor of Psychology at Yale to his regular position at Michigan.

Miami University has now a Bureau of Special Education and Psychoeducational Clinic with six full-time staff members and two part-time assistants in the center at Dayton and three part-time assistants at Toledo. The Director, Prof. J. E. W. Wallin, is Consulting Psychologist in the Dayton schools and will soon have appear from the Houghton Mifflin Company, Riverside Press, a text book in Clinical and Abnormal Psychology, a companion volume to The Education of Handicapped Children, also by Dr. Wallin.

Pennsylvania State College reports the resignation of Dr. David Allen Anderson who has accepted the Presidency of the Kent State Normal, Kent, Ohio. Dr. Carroll D. Champlin, Southwestern State Normal School, Pa., has been appointed Professor of Education at Pennsylvania State College.

Vassar College announces the publication of "From Myth to Reason" by Dr. Woodbridge Riley. Dr. Riley acted as chairman of the section on Current Philosophy at the Sixth International Congress of Philosophy in Cambridge, Mass., held recently.

Northwestern University reports the return of Prof. R. H. Gault from two years leave with the National Research Council. He will give half of his time to his research work on tactual speech and half to teaching. Prof. Delton T. Howard has been appointed Personnel Director. Dr. Esther Gatewood has been made Assistant Professor and Dr. William H. Sheldon, formerly Assistant Dean in the School of Commerce and Administration, University of Chicago, has been made an Assistant Professor of Psychology.

The University of Rochester announces the death of Dr. Elliott Frost, Professor of Psychology and Education and Director of University Extension and the Summer Session. Dr. Hulsey Cason has been appointed Assistant Professor of Psychology.

"New Type Content Examination," Columbia Research Bureau Tests for High Schools and Colleges. The Bureau of Collegiate Research of Columbia University, Dr. Ben D. Wood, Director, has had published recently by the World Book Company six such tests: English, French, Spanish, German, Physics and Plane Geometry. Tests in other subjects are being prepared. Those interested will address World Book Company, Yonkers, N. Y.

Industrial Psychology announces a special double issue on "Industrial Adjustment through Vocational Guidance." This should be a valuable reference work on the world-wide status of vocational guidance for the second half of this year. Dr. Douglas Fryer, editor of this special number, was abroad last summer in search of authoritative material.

Scholastic, a national magazine for the high school and class room, has announced four groups of major awards for creative work by secondary school children in literature, art and civics. No subjects are assigned. The Pittsburg Plate Glass Company is sponsor for these awards. Address "Scholastic" Wabash Building, Pittsburg, Pa.

Children, The Magazine for Parents, 353 Fourth Avenue, New York City, is offering a new pamphlet on "Group Study for Parents." Detailed information is given concerning the organization of such groups and a list of recommended books on child study is divided into seven classifications: (1) General, (2) Health and Feeding, (3) Sex and Adolescence, (4) Child Psychology, (5) Education, (6) The Family and the Race, and (7) Fiction Interpreting Child Life. This pamphlet may be had for ten cents and the books ordered from this magazine.

In the Psychological Laboratory of the Boston Psychopathic Hospital, Miss Edith F. Symmes, Psychologist, has resigned to take up work under a Fellowship at Yale. Her duties are temporarily taken over by Miss Clairette P. Armstrong, of the Children's Court Clinic, New York City. Miss Frances Botkin, with the Laboratory during the summer, has returned to her position at Smith College, her work being taken over by Miss Barbara Kendall. Mr. E. N. Brush, graduate student in the Harvard Psychological Laboratory, is interne in psychology at the Hospital for the coming year.

The Committee on Child Development, Division of Anthropology and Psychology of the National Research Council, desire that the attention of promising and interested candidates be called to the National Fellowships in Child Development, made possible by the Laura Spelman Rockefeller Memorial grant. The aim is to attract to this field of investigation qualified workers who will increase the scientific knowledge of the child along various lines and bring this knowledge to parents and others concerned with child life. Those interested should address Dr. R. L. Marston, Executive Secretary, Committee on Child Development, National Research Council, Washington, D. C.

Prof. Herbert A. Toops, Ohio State University, has reported that thirty-two colleges, member of the Ohio College Association, are engaged in a program of intelligence testing and research in which over 12,000 freshmen examinations have been given.

BOOK REVIEWS

Leonard T. Troland. *The Mystery of Mind.* New York: D. Van Nostrand Company, 1926. 253 pages.

While this book is not written for the technician immersed in the application of modern psychological methods to the practical problems of human life, yet the best work in applied psychology is still so near to the fundamental problems of human behavior that the systematic and theoretical developments in the normal field are still necessary interests for the technician. Dr. Troland's book represents a departure from traditional conceptions particularly with respect to the able manner in which he has related the accumulating wealth of new material in physics, biochemistry, and biology to the profound changes that are occurring in our conceptions of the nature of human activity. This explains the originality which is found in the treatment of such topics as: What is mind? the nature of consciousness, what is matter? the interrelations of consciousness and matter, sensation as the foundation of mind, human happiness and personality, the fundamental relations of consciousness and electricity, and other headings.

Chapter XII on the physics of nerve action is one of the clearest expositions of the recent work on the nature of the nervous mechanism with which the reviewer is familiar. In the second paragraph of this chapter we are reminded of Troland's systematic status, "Let us remember" he says "that consciousness and the material world of physical science are two entirely different and separate things. Let us not forget, however, that these two systems are bound together by laws, so that the changes which occur in one seem to be determined by those which take place in the other" (p. 180). This is a dualistic position. The physical universe is governed, presumably, in conformity with the law of the conservation of energy, while " . . . . the sentient universe" (mind) "as a whole is governed by a hedonistic law" (p. 242).

The clarity of the subsequent exposition in Chapter XIII on the relations of consciousness and electricity is somewhat dimmed. After an altogether brilliant analysis of visual physiological functions we read, "Now the total nature of the process in the cortex which corresponds to the red sensation will involve the inherent nature of the 'red receiver' as well as the special rhythm which represents red in the nerve current. Hence we must suppose that there is a special material or electrical structure underlying red as well as a special activity or change. Thus the 'red excitation' in the cortex, regarded as a whole, is a combination of structural and the dynamical (or change) features. *It is a certain structure undergoing a certain change*" (p. 212). One wonders how such an able physicist could forget the law of the conservation of energy long enough not to realize that the "red excitation" in the cortex cannot stop in the cortex. It must go somewhere. If, as Troland himself would probably agree, its only outlet is into some effect or pattern, the postulate of a separate non-physical entity (a red sensation) is superfluous. Why not assume that the effector pattern is the concrete physical condition to which we have given the abstract name "a red sensation"?

This introduces the controversial topic of physical *versus* psychical monism, which carries us beyond the limits of this review and of Troland's excellent book. But, that a permanently dualistic system is unacceptable to him is clear from his closing section which carries the title, Idealism. Yet throughout the book the dualistic assumption is so dominant that we must regard his monism as provisional. Does not the following quotation warrant our doing so? He says, "However, we cannot hope in the present book to make such a doctrine" (psychical monism) "really clear. To do so would be too difficult and if successful would unduly dispel the 'mystery of mind'; which it has been our purpose to set forth rather than to solve" (248).

ALBERT P. WEISS,
Ohio State University.

FLORENCE L. GOODENOUGH. *Measurement of Intelligence by Drawings.* Institute of Child Welfare, University of Minnesota. In Measurement and Adjustment Series, edited by Lewis M. Terman. Cloth. xiv + 177 pages. Illustrated. Price $1.80. Also *Goodenough Intelligence Test*, by the same author. Children's Drawing Sheet in package of 25, with Key and Class Record, 60 cents net per package. Yonkers-on-Hudson, New York: World Book Company.

To those who are a little tired of the sameness of content of many of the tests of intelligence recently developed, Dr. Goodenough's test will be a refreshing novelty. After several years of patient research, the author of *Measurement of Intelligence by Drawings* has published her test and a descriptive account of results from its use. The book summarizes work in a new field of mental measurement about which little of a quantitative nature has previously been known.

If ever in the consideration of scientific work an *a priori* judgment were dangerous, it would be in deciding upon the merits of Dr. Goodenough's contribution. The reader who glances through the book and decides upon its merits after a brief skimming (perhaps also the cursory study of scoring methods in some of the figures in Chapter VII) is liable to do a serious injustice to the author. Only after a careful study of the entire book and a correct application and scoring of the test is any one able to judge the value of this work. For Dr. Goodenough's test is perhaps far less convincing at first view and upon superficial analysis than any test of intelligence now in use.

The test is non-verbal, easy to administer and takes but ten minutes to give. The practiced scorer can score a blank in about two minutes. Briefly summarized, the directions merely request the child to "make a picture of a man." The test is useful with children in the kindergarten and primary grades, or from mental age 4 to mental age 10. Its reliability for a single unselected age group in this range lies between 0.80 and 0.90. For separate age groups in the same range it yields an average correlation of 0.76 with the Stanford-Binet.

Part I of the book contains an historical survey of the problem of the relationship between intelligence and drawing, an account of the methods employed in building the Goodenough Test and discussions of results so far obtained by its use. An interesting chapter on the psychological interpretations of drawing opens up many possibilities for future research studies. Part II contains a description of the test procedure and detailed directions for scoring. A bibliography of almost 200 titles is given at the end.

The book is a very valuable and important contribution to the literature of intelligence measurement. If the test does in practice what it has done in its standardization, it will prove a useful part of the testing program in the kindergarten and primary grades.

NORMAN FENTON,
Ohio University.

SAMUEL D. SCHMALHAUSEN. *Humanizing Education.* The New Education Publishing Company, 1926. Pp. 343.

This is a series of essays, or tirades, on current educational practices the underlying theme of which seems to be "Whatever is, is wrong." It is written in the most improved ultramodern style. Incomplete sentences. Many exclamation points! No plot. It does point out some of the sore spots in our ways of educational thinking and doing and is, in rare instances, rather clever. Its general tone, however, will not probably attract many readers. An appended "Psycho-biography" tells the reader of the author's difficulties in securing a publisher and reveals to one with slight training in abnormal psychology, the real reason for the book.

H. I. SCHOU, M.D. *Religion and Morbid Mental States.* Translated from the Danish by W. Worster, The Practical Christianity Series. The Century Co., 1926, Pp. 217.

This series of lectures delivered to a group of clergymen at the University of Copenhagen is an attempt to acquaint spiritual doctors with some of the symptoms, conditions and methods of treatment of those common mental diseases with which they are particularly apt to come in contact. Dr. Schou shows that many forms of mental disorder commonly display themselves in some sort or other of religious activity. This being true it is manifestly desirable that the clergy have some training in the recognition of these abnormal conditions in order that they may in some cases give real relief and in others realize the need of reference to medical aid. He admits the real value of religion in the care of certain disorders and advocates the Holland plan of having separate hospitals for those of differing religious attitudes—a Protestant hospital, a Catholic one and a "neutral" one.

The book treats particularly of: the relations of religion to melancholia, manic depressive insanity, certain incurable diseases—e.g., *dementia praecox;* religion as a propaedeutic and as a cause of insanity and religion in nervousness and mental degeneration. Although religion is sometimes recognized as a cause of insanity it is shown to much more frequently be of actual aid in the prevention of mental disorders. Brief discussion of each topic is followed by case studies. Nontechnical language is used and the book throughout is simply written—too simply for use as a textbook in classes in abnormal psychology but admirably adapted for its intended audience, clergymen of little or no training in abnormal psychology or psychiatry.

H. GORDON HULLFISH. *Aspects of Thorndike's Psychology in Their Relation to Educational Theory and Practice.* Ohio State University Studies, Contributions in Principles of Education No. 1. 1926. Pp. 113.

In this monograph Hullfish insists that a good structure of educational practice can be erected only upon a consistent theoretical basis of psychology. A brief analysis shows that psychologists are not agreed as to the nature of mind and, therefore, that educational practice is in chaos. An examination of several of Thorndike's doctrines reveals that they are not consistent with any one psychological theory and so he is particularly dangerous as an educational leader. As a matter of fact, consistency is not really that for which Hullfish is seeking for it is obvious from the tone of his references to other systems, e.g., behaviorism—which is "crass," that they will not do. Like a good controversalist, he presents a substitute plan, but as his psychological theory is supported by no whit of evidence other than the mere say-so of himself and Professor Dewey, it is difficult for the reviewer to see how he may expect it to bring about, as yet, sweet concord among the disagreeing psychologies of 1925.

Specifically, Hullfish objects: to Thorndike's doctrines, of readiness—it is mechanistic, of satisfiers and annoyers—they imply a dualism, of concept formation—common elements do not exist and anyway the treatment is dualistic, of learning as analysis—not enough is made of synthesis, to his treatment of the stimulus as something physical, to his faith in the measurability of educational products and to his lack of emphasis on ultimate social aims.

Hullfish's method is literary and proof-text and as usual this method leads its author into difficulties. His whole section on analysis and synthesis in learning is based on the inference from "All learning is analytic" to "Learning is all analytic" and falls in the face of: "Of this analytic learning . . . . fuller account will be given later. The simpler connection-forming . . . . is obviously the primary fact and will be considered first" (Thorndike, *Educational Psychology*, Briefer Course, p. 141). There are numerous cases where similar counter proof-texts might be given—notably in relation to the matters of concept and habit formation—and whereas no other sort of evidence is presented, one side has as good a case as the other.

Hullfish does show that Thorndike's doctrine of satisfiers and annoyers implies a dualism. To overcome this dualism, Hullfish postulates "meanings." (Or "suggested objects," or "ideas," or "concepts," p. 96.) These meanings are "real" but they are "non-physical," on a "different level than the physical," "not quantitative," "not measurable." They can be "detached from physical objects" and "attached to symbols." (These symbols are "carriers of meanings.") They "compete with each other" and moreover act as stimuli and produce reactions. (See chapters VI and VII.) And the very existence of these meanings as a firm foundation for our educational edifice is to be taken on faith. However, this lack of evidence will probably disturb only those who are "Hypnotized by the fetish of science."

Hullfish is particularly opposed to the doctrine of the measurability of educational products and holds that the really valid aims are the enrichment of social concepts. Since these concepts are immeasurable it would seem to follow that the student and teacher alike are faced with the dreary prospect of years of endeavor in view of a goal but without the slightest means of knowing of any progress towards it is being made. It is quite possible that Thorndike will be content to "drill" along, happy in the thought that at least he can tell if he is getting anywhere.

D. A. WORCESTER,
Ohio University.

WALTER SCOTT MCNUTT. *A Handbook for Socializing Education through Community Welfare Clubs.* Boston: The Palmer Company, 1926. 54 pp. $1.00.

Despite its ambitious title, this slender paper-covered volume without table of contents, index, or bibliography, and with but a partial treatment of the field indicated, should be classified as a pamphlet rather than as a handbook in the traditional sense of the term.

The author makes an ardent plea for "social education" as against "individual education" and goes so far as to say that "we must socialize education to save the state." This very general objective, he believes, can best be realized through the socializing influence of what he calls "community welfare clubs." Under this category he describes briefly a few of the well-known features of such Organizations as Boy Scouts, World Scouts, Girl Scouts, Big Brothers and Big Sisters, and the boys' and girls' clubs sponsored by state departments of agriculture. He also mentions clubs for farmers and their wives. By means of practical suggestions, model constitutions, and programs the author demonstrates how such organizations may be started and successfully operated. He is convinced that the school building, as the natural center of interest for the entire community, will in time become the "social center" where such club activities will be carried on.

The volume, though limited in scope and in keenness of sociological penetration, offers practical suggestions to leaders of boys' and girls' clubs. Educators might be interested in the author's theory of social education, although, struggling as they do with the problem of finding specific materials and specific methods for the attainment of specific objectives for specific type groups and individuals, they will probably not share the author's enthusiasm for a social education so vaguely defined and yet so confidently considered as the magic solution for all the knotty problems of our present social order.

ARTHUR H. ESTABROOK AND IVAN E. MCDOUGLE. *Mongrel Virginians: The Win Tribe.* Baltimore: The Williams & Wilkins Company, 1926. 205 pp. $3.00.

This book is the outcome of an extended and painstaking investigation into the genetic relationships and the resulting physical, mental, and social characteristics of a mongrel Indian-White-Negro group occupying an isolated strip of land four miles wide and eight miles long in the foothills of the Blue Ridge Mountains of Virginia. Assisted by a group of students trained in sociology the two investigators, one a eugenist of the Carnegie Institution of Washington, the other a professor of sociology of Goucher College, examined state and county records and interviewed officials, mission workers, teachers and long-time residents of the district bordering on the territory of the "Win tribe," as the group is called by the investigators. The Wins themselves were interrogated frequently and were observed over a period of two years. The intricate genetic and social patterns of the century-old group could thus be reconstructed in the form of diagrams, statistical tables, and descriptive paragraphs packed with information. As a whole this represents the most complete scientific study of triple race mixture in a small area that has come to the attention of the reviewer.

The Win group, it appears, originated in 1700, when two Indian strains, perhaps only partly pure, mingled in marriage with a white strain. Another Indian strain was added in the second generation, and Negro blood entered somewhat later. Effective isolation due to the stigma of color prevented scattering of the Wins and forced them to intermarry within their own blood group, yet did not check the infiltration of inferior white and colored blood from the outside, partly through legal marriage and partly through illegitimate sex relations. The authors assume the Indian, Negro, mixed, and late white stock, with the exception of one case, to have been distinctly inferior to the original white stock, which they rate as "at least of normal ability." The present population of six hundred and fifty-eight persons, reproducing at an average fecundity rate for all generations of 4.71 per childbearing female, inbreeding at a rate of approximately 50 per cent, having a general average illegitimacy rate of over 20 per cent, exhibiting feeblemindedness in practically every person in varying degrees, and living on a very low economic, social, and cultural plane, presents a picture of startling human and social deficiency. An unusually low record of alcoholism, venereal disease, and crime appear as the only bright spots on the otherwise extremely gloomy canvas.

Does race mixture of the type described invariably lead to a lowering of mental capacities in the offspring? The authors carefully refrain from formulating a positive answer to this question. They insist that the materials are presented as a "careful summary of the facts of history" and not as a theory on race mixture. Yet, they include in their study a dozen outline sketches of triple race mixture in other parts of the South, many picturing an inferior type of progeny; they append a copy of the Virginia Racial Integrity Law of 1024; they express the belief that if this law can be enforced, it will preserve racial integrity; and their publishers announce on the jacket of the volume that the findings will have "vital and important bearings on racial integrity and the maintenance of the 'color line' in the South." Thus the findings are unfortunately given greater universality than was obviously intended by the authors. It is to be hoped that the investigators will soon find it possible to complete the projected studies mentioned in the volume so that comparable data be obtained for generalizations of wider social significance. In the light of recent studies in the fields of psychiatry and social work it might seem desirable to measure the influence of the social environment upon the mental reactions and the organization of personality in the Win area in order to detect any spurious innate deficiencies.

As the study stands, it impresses the reviewer as a piece of careful research yielding valuable data to the future investigator in the field of race mixture. The authors also deserve the gratitude of the State of Virginia for uncovering errors in the census classification of colored persons which would have worked injustice to those marrying under the Racial Integrity Law, and for calling attention to a problem of serious social inadequacy.

H. J. JEDDELOH,
Ohio University.

TRUMAN L. KELLEY. *Influence of Nurture upon Native Difference.* New York: The Macmillan Company, 1926.

It has been recognized for many years that the different varieties of the human race exhibited different characteristics of temperament, intelligence, habits, and physical vitality and acquirements. It has also been admitted that history, political, religious, commercial, and racial, has been determined to a greater or less extent by the diversity of these characteristics. In spite of this somewhat general cognizance of those important factors in the history and welfare of nations and races, little organized, scientific study of them was ever made until the last few years of this present century. And even at the present time the few facts available are chiefly physical and, to a much less extent, mental measurements and comparisons of two or more races.

The vastly important characteristic of temperament, what we might call the innate tendencies, of a race has been almost wholly disregarded due partly to failure to realize its importance but chiefly to the apparently hopeless complexity of the problem.

The work reported which forms the basis of the news expounded in this extremely interesting book was performed by the authors in what is probably the most desirable place in the world from an experimental point of view, Hawaii. The mixture of races combines every known race except the American Indian and several varieties of some of them.

Part I of the book is introductory, giving the reasons for the investigations, the importance of temperament in the race, and the methods to be used.

Part II gives a very interesting and valuable history of the different races present in Hawaii. This part alone would justify anyone in spending the time to read it carefully, leading as it does to the heart of the problem of over-population in certain countries, with its attendant dangers of economic and racial imperialism. This part is extremely informative to anyone interested in the origin of such a diversity of peoples as occur in this small group of islands.

Part III is a social analysis of the different races and gives the results of the individual temperament of the race. The different races are rated according to the strength or weakness of certain social traits. Some of the social traits listed are lack of planning ability, impulsiveness, irresolution, etc., and their opposites. From these it can be seen that the method while rather unique and recent in scientific investigation, goes to the very center of the cause of racial difference and superiority or inferiority.

A racial efficiency index is worked out from the scores in the different social traits. It will be of interest to any reader to see the results of this ranking to find that the Japanese and Chinese are at the top.

Thus in the light of scientific studies, incomplete and inconclusive though they may be, we are beginning to see that there are few bases for our exalted opinion of the white races. Again in social adjustment as measured by lack of criminality, business initiative, success in professions and trades, etc., we find many surprises.

Part IV deals with the brain development of the different races and gives some very illuminating facts and conclusions concerning the cranial capacity at different ages for both sexes of Anglo-Saxon, Japanese and Chinese children. The Japanese are shown to have a cranial capacity greater than the Chinese, and equal to whites of the same social standing. The history of the races in Hawaii is of importance here in classifying the children into the proper social groups.

Part V gives facts relative to the mentality of the different races. Binet tests and Army tests were made. In these tests the Chinese compared very favorably with Northern Europeans and Americans, and excel considerably Southern Europeans. The authors very carefully point out however that these tests are only a measure of school intelligence and not of racial intelligence. In order to measure racial intelligence the tests for social traits and adaptability must be included.

Parts VI and VII are given to a discussion of the importance of exact knowledge concerning the relation of temperament to race and to racial futures. Strength of racial character is needed to safeguard a nation or a race rather than military fortifications. The Japanese are shown to be superior to all other groups in planning capacity, resolution and self-control. New ideas of behavior consistent with character must be adopted to conserve whatever superiorities of race we may possess.

EMMETT ROWLES,
Ohio University.

HENRY J. DOERMAN. *The Orientation of College Freshmen.* The Williams & Wilkins Company, 1926. 162 pp. $3.00.

Perhaps no single feature will give a better idea of the scope of this work than the three main divisions into which the outline falls, viz.:

Part I. Statement of the problem.

Part II. Current Practices with Respect to the Problems of Orientation in Representative American Colleges.

Part III. A Guidance Program.

In the first part the problems of the freshman and of the administration are analysed and the need for guidance of entering students is pointed out. Both the administration and the freshman should have a clear conception of the aims of the college in terms of which adjustment of the student to his college career should take place.

Part II embodies a thorough description of the more important methods of selecting students for admission to college, advisory systems and orientation courses.

The third part of the book is in many ways the most valuable. After showing that student guidance in the colleges is inadequate and ineffective, the author suggests a personnel service or guidance department of which he says:

"Its effectiveness is bound up with the utter avoidance of impersonal methods and machinery. . . . . It must be the business of some one in the college to see that the student is adequately known and understood. This does not mean that teachers and other officers have less responsibility for becoming better acquainted with their students, nor does it mean that they should discontinue giving advice when it is sought, but it does mean that there must be some agency in the college where as nearly a complete picture as it is possible to obtain is available for the purpose of guidance."

The relation of the personnel service to the dean's office is discussed. Various phases of guidance before, during and after registration are outlined. An extensive bibliography adds to the value of the book. Anyone engaged in administrative or advisory work can scarcely fail to find this contribution helpful. It is to be hoped that it will find its way into the hands of many college presidents and deans who are not yet awake to the need of the student for assistance in adjusting himself to college life.

AMOS C. ANDERSON,
Ohio University.

NEW BOOKS AND PAMPHLETS RECEIVED*

Books and pamphlets for reviews should be sent to James P. Porter, Department of Psychology, Ohio University, Athens, Ohio.

Ability, A Psychological Study. VICTORIA HAZLITT. Macmillan Company, New York. 147 pp.

Adaptation of Subject-Matter and Instruction to Individual Differences in Elementary Schools. PEDRO T. ORATA. Educational Research Circular No. 40. University of Illinois, Urbana, Ill. 10 pp.

Conservation of the Family. PAUL POPENOE. Williams & Wilkins Company, Baltimore, Md. $3.00. 260 pp.

Effect of Time upon Variability, The. ELLA WOODYARD. Bureau of Publications. Columbia University, New York.

Genetic Studies of Genius, Vol. II. CATHARINE M. COX. Stanford University Press, Stanford University, Calif. $5.00. 842 pp.

Individual Differences in Intelligence of School Children. MARY M. WENTWORTH. Harvard Studies in Education No. 7. Harvard University Press, Cambridge, Mass. 158 pp.

Influence of the Summer Vacation on the Abilities of Fifth and Sixth Grade Children. MARGARET E. NOONAN. Bureau of Publications, Columbia University, New York.

Introduction to Social Psychology, An. L. L. BERNARD. Henry Holt & Company, New York. 651 pp.

The Language and Thought of the Child. JEAN PIAGET. Harcourt, Brace & Company, New York. $3.75. 246 pp.

Learning How to Study and Work Effectively. WILLIAM F. BOOK. Ginn & Company. 475 pp.

Mental Abnormality and Deficiency. SIDNEY L. AND LUELLA COLE PRESSEY. Macmillan Company, New York. 356 pp.

A New Method of Mental Testing. J. J. STRASHEIM. Warwick & York, Baltimore. 158 pp.

The Orientation of College Freshmen. HENRY J. DOERMANN. Williams & Wilkins, Baltimore. $3.00. 162 pp.

Psychological Studies. THEODOR LIPPS. Williams & Wilkins, Baltimore. $6.00. 333 pp.

Psychology for Teachers. BENSON, LOUGH, SKINNER AND WEST. Ginn & Company, Columbus, Ohio. $2.00. 300 pp.

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* Mention here does not preclude further comment.

Report on Age and Progress of Pupils in the Boston Public Schools. School Document No. 12, 1925. Boston Public Schools. 136 pp.

Psychology of Thought The. H. L. HOLLINGWORTH. D. Appleton Company.

The Social-Ethical Significance of Vocabulary. GLADYS C. SCHWESINGER. Bureau of Publications, Columbia University, New York.

Some Difficulties in Elementary School History. ADELAIDE M. AYER. Bureau of Publications, Columbia University, New York.

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